

# Comprehensive Bibliography

## on Martian Meteorites

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- Abu Aghreb A.E., Ghadi A.M., Schlüter J., Schultz L. and Thiedig F. (2003) Hamadah al Hamra and Dar al Gani: A comparison of two meteorite fields in the Libyan Sahara (abs). *Meteoritics & Planet. Sci.* 38, A48.
- Agee Carl B. (2002) Garnet and majorite fractionation in the early Earth and Mars (abs#1862). *Lunar Planet. Sci. XXXIII* Lunar Planetary Institute, Houston. (CD-ROM). (*see address of LPI in Appendix III*)
- Agee C.B., Bogard Don D., Draper D.S., Jones J.H., Meyer Chuck and Mittlefehldt D.W. (2000) Proposed science requirements and acquisition priorities for the first Mars sample return (abs). In Concept and Approaches for Mars Exploration. Part 1 (ed. S. Hubbard) LPI Contribution # 1062. Lunar Planetary Institute, Houston.
- Agee C.B. and Draper Dave S. (2003) Melting of model Martian mantle at high pressure: Implications for the composition of the Martian basalt source region (abs#1408). *Lunar Planet. Sci. XXXIV*, Lunar Planetary Institute, Houston (CD-ROM).
- Agerkvist D.P. and Vistisen L. (1993) Mössbauer spectroscopy of the SNC meteorite Zagami (abs). *Lunar Planet. Sci. XXIV*, 1-2. Lunar Planetary Institute, Houston.  
Zagami
- Agerkvist D.P., Vistisen L., Madsen M.B. and Knudsen J.M. (1994) Magnetic properties of Zagami and Nakhla (abs). *Lunar Planet. Sci. XXV*, 1-2. Lunar Planetary Institute, Houston.  
Zagami Nakhla
- Akai J. (1997) Characteristics of iron-oxide and iron-sulfide grains in meteorites and terrestrial sediments, with special references to magnetite grains in Allan Hills 84001 (abs). *Meteoritics & Planet. Sci.* 32, A5.  
ALH84001
- Akaogi M., Haraguchi M., Yaguchi M., Nakanishi K and Kojitani H. (2008) High-pressure phase relations for Ca,Na aluminosilicate, CAS phase, with implications to shocked Martian meteorites (abs). *Meteor. & Planet. Sci.* 43, A16.
- Albarede F., Blichert-Toft Janne, Vervoort J.D., Gleason J. and Rosing M.T. (1999) The early evolution of the Earth and Mars from hafnium-neodymium isotopic systematics. *Ninth Annual V. M. Goldschmidt Conference* 3, Cambridge.
- Albarede F., Bouvier A. and Blichert-Toft Janne (2009) More old news from Martian meteorites (abs#1914). *Lunar Planet. Sci. XL*, Lunar Planetary Institute, The Woodlands.
- Albee Ardent (2002) Martian rocks, minerals and mantles (abs). *Meteoritics & Planet. Sci.* 37, A9.
- Allen R.O. and Mason Brian (1973) Minor and trace elements in some meteoritic minerals. *Geochim. Cosmochim. Acta* 37, 1435-1456.  
Nakhla
- Allen R.O. and Clark P.J. (1977) Fluorine in meteorites. *Geochim. Cosmochim. Acta* 41, 581-585.  
Shergotty

- Allen Carl C. (1996) What will returned samples tell us about Martian volatiles (abs). In *Workshop on evolution of Martian volatiles*. (eds. Jakosky and Treiman) *LPI Tech. Rpt.* 96-01, 1-2. Lunar Planetary Institute, Houston.
- Allen C.C. and Treiman Allan H. (1995) Who needs a few more Mars samples when we already have the SNCs? (abs) *Lunar Planet. Sci.* XXVI, 27-28. Lunar Planetary Institute, Houston.
- Allen C.C., Morris R.V., Lindstrom Dave J., Lindstrom Marilyn M. and Lockwood J.P. (1997a) JSC Mars-1: Martian regolith simulant (abs). *Lunar Planet. Sci.* XXVIII, 27-28. Lunar Planetary Institute, Houston.
- Amato I. (1989) Meteorite may carry organic Martian cargo. *Science* 136, 53.  
EETA79001
- Anand M., Williams C.T., Russell S.S., Jones G., James S., and Grady Monica M. (2005a) Petrology and geochemistry of nakhelite MIL03346: A new martian meteorite from Antarctica (abs#1639). *Lunar Planet. Sci.* XXXVI Lunar Planetary Institute, Houston.  
MIL03346
- Anand M., Russell Sara S., Mullane E. and Grady M.M. (2005b) Fe isotopic composition of Martian meteorites (abs#1859). *Lunar Planet. Sci.* XXXVI Lunar Planetary Institute, Houston.
- Anand M., Russell S.S., Blackhurst R. and Grady M.M. (2006) Fe isotopic composition of Martian meteorites & some terrestrial analogues (abs#1824). *Lunar Planet. Sci.* XXXVII Lunar Planetary Institute, Houston.
- Anand M., James S., Greenwood R.C., Johnson D., Franchi I.A. and Grady M.M. (2008) Mineralogy and geochemistry of shergottite RBT04262 (abs#2173). *Lunar Planet. Sci.* XXXIX Lunar Planetary Institute, Houston.  
RBT04262
- Anders Edward (1996) Evaluating the evidence for past life on Mars. *Science* 274, 2119-2120.  
ALH84001
- Anders E. and Grevesse N. (1989) Abundances of the elements: Meteoritic and solar. *Geochim. Cosmochim. Acta* 53, 197-214. (*the great divider*)
- Angel J.R.P. and Wolff N.J. (1996) Searching for life on other planets. *Scientific American* 274(4), 60-66.
- Annestad J.O. (1983) *Meteorite concentration and glaciological parameters in the Allan Hills Icefield, Victoria Land, Antarctica*. PhD dissertation, Johannes Gutenberg Univ., Mainz.
- Antretter M. and Fuller M. (2001) Paleomagnetic and rock magnetic studies of ALH84001 (abs). *Meteoritics & Planet. Sci.* 36, A11-12.  
ALH84001
- Antretter M., Fuller M., Scott E., Jackson M., Moskowitz B. and Solheid P. (2003) Paleomagnetic record of Martian meteorite ALH84001. *J. of Geophys. Res.* 108, 5049, doi:10.1029/202JE001979  
ALH84001
- Aramovich C.J., Herd Chris D.K. and Papike J.J. (2001) Possible causes for late-stage reaction textures associated with pyroxferroite and metastable pyroxenes in the basaltic Martian meteorites (abs#1003). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
QUE94201 Los Angeles Shergotty Zagami

- Aramovich C.J., Herd C.D.K. and Papike J.J. (2002) Symplectites derived from metastable phases in Martian basaltic meteorites. *Amer. Mineral.* 87, 1351-1359.  
Los Angeles QUE94201 Shergotty
- Ariskin A.A. (1997) Parent magmas of SNC harzburgites: Phase equilibria modeling (abs). *Lunar Planet. Sci.* XXVIII, 51-52. Lunar Planetary Institute, Houston.  
LEW88516 ALHA77005
- Artemieva N.A. and Stöffler Dieter (2002) Conditions for the “Launch Window” of martian meteorites: Observations and modeling (abs). *Meteoritics & Planet. Sci.* 37, A13.
- Ash R.D., Knott S.F. and Turner Grenville (1995) Evidence for the timing of the early bombardment of Mars (abs). *Meteoritics* 30, 483.  
ALH84001
- Ash R.D., Knott S.F. and Turner G. (1996) A 4-Gyr shock age for a Martian meteorite and implications for the cratering history of Mars. *Nature* 380, 57-59.  
ALH84001
- Ashley G.M. and Delaney J.S. (1999) If a meteorite of Martian sandstone hit you on the head would you recognize it? (abs#1273) *Lunar Planet. Sci.* XXX, (CD-ROM) Lunar Planetary Institute, Houston.  
Good Question
- Ashwal L.D., Warner J.L. and Wood Chuck A. (1982a) SNC meteorites: Evidence against an asteroidal origin (abs). *Lunar Planet. Sci.* XIII, 22-23. Lunar Planetary Institute, Houston.
- Ashwal L.D., Warner Jeff L. and Wood C.A. (1982b) SNC meteorites: Evidence against an asteroidal origin. *Proc. Lunar Planet Sci. Conf.* 13th; *J. Geophys. Res.* 87, A393-A400. (*review paper*)
- Ashworth J.R. and Hutchison R. (1975) Water in non-carbonaceous stony meteorites. *Nature* 256, 714-715.  
Nakhla
- Attia A.A., El-Shazly E.M., Moharram M.O. and Huzain A.A. (1955) Meteorites and related bodies with a guide to the collection of the Geological Museum, Cairo. *Geological Museum, Les Editions Universitaires d’Egypte* Paper No. 1, 51 pp. Cairo.  
Nakhla
- Bada J.L. (1999) A review of “The search for life on other planets” by Bruce Jakosky. *Meteoritics & Planet. Sci.* 34, 680-681.
- Bada J.L. and McDonald G.D. (1995) Amino acid racemization on Mars: Implications for the preservation of biomolecules from an extinct Martian biota. *Icarus* 114, 139-143.
- Bada J.L., Hayes J., Keller L., Kvenvolden K. and Mathies R.A. (1997) Memo on *Organic contamination of Martian meteorites at the Johnson Space Center curatorial facility*. JSC Curator’s Office, Houston
- Bada J.L., Glavin D.P., McDonald G.D. and Becker L. (1998a) Amino acids in the ALH84001 Martian meteorite (abs#1894). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001
- Bada J.L., Glavin D.P., McDonald G.D. and Becker L. (1998b) A search for endogenous amino acids in Martian meteorite ALH84001. *Science* 279, 362-365.  
ALH84001

Badjukov D.D., Nazarov M.A. and Taylor L.A. (2001) Shock metamorphism in the Shergottite meteorite Dhofar 019 (abs#2195). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM). Dho019

Bailey J.V., McKay D.S. and Wentworth S.J. (2003) Mn carbonates in the Martian meteorite Nakhla: Possible evidence of brine evaporation (abs#2060). *Lunar Planet. Sci.* XXXIV Lunar Planetary Institute, Houston Nakhla

Baker L., Franchi I.A., Wright I.P. and Pillinger C.T. (1998) Oxygen isotopes in water from Martian meteorites (abs). *Meteoritics & Planet. Sci.* 33, A11-12. Nakhla ALH84001

Baker L.L., Agenbroad D.J. and Wood S.A. (2000) Experimental hydrothermal alteration of a Martian analog basalt: Implications for Martian meteorites. *Meteoritics & Planet. Sci.* 33, 31-38.

Ball J. (1912) The meteorite of El-Nakhla El-Baharia. Egypt Survey Department, paper 25. Cairo Nakhla

Banfield J.L. (2002) Global mineral distributions on Mars. *J. Geophys. Res.* 107,

Bandfield J.L., Hamilton V.E. and Christensen P.R. (2000) A global view of Martain surface composition from MGS-TES. *Science* 287, 1626-1630.

Barber D.J., Scott E.R.D. and Consolmagno G. (2001) Transmission electron microscopy of carbonates and associated minerals in ALH84001: Impact-induced deformation and carbonate decomposition (abs). *Meteoritics & Planet. Sci.* 36, A13-14. ALH84001

Barber D.J. and Scott E.R.D. (2002) Origin of supposedly biogenic magnetite in the Martian meteorite Allan Hills 84001. *Proc. Nat. Acad. Sci.* 99, 6556-6561. ALH84001

Barber D.J. and Scott E.R.D. (2003) Transmission electron microscopy of minerals in the Martian meteorite Allan Hills 84001. *Meteoritics & Planet. Sci.* 38, 831-848. ALH84001

Barber D.J. and Scott E.R.D. (2006) Shock and thermal history of Martian meteorite Allan Hills 84001 from transmission electron microscopy. *Meteoritics & Planet. Sci.* 41, 643-662. ALH84001

Barker W.W. and Banfield J.F. (1999) HRTEM evidence for low temperature alteration of pyroxene to smectite in ALH84001. *Geol. Soc. Amer. Prog. Abs.* 31:7, A-432.

Barlow N.G. (1990) Constraints on early events in Martian history as derived from the cratering record. *J. Geophys. Res.* 95, 14191-14201.

Barlow N.G. (1997) The search for possible source craters for Martian meteorite ALH84001 (abs). *Lunar Planet. Sci.* XXVIII, 65-66. Lunar Planetary Institute, Houston. ALH84001

Barlow N.G. (1998) Status report on the search for craters of ALH84001 (abs#1705). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM). ALH84001

Barrat J.A., Gillet P., Lecuyer C., Sheppard S.M.F. and Lesourd M. (1998) Formation of carbonates in the Tatahouine meteorite. *Science* 280, 412-414.

Barrat J.A., Gillet P., Jambon A., Sautter V., Javoy M., Petit E. and Lesourd M. (2001a) New from the Moon and Mars: preliminary examinations of two new Saharan finds (abs#1317). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
NWA480

Barrat J.A., Gillet P., Sautter V., Jambon A., Javoy M., Göpel C., Keller F. and Petit E. (2001b) The basaltic shergottite North West Africa 480: petrology and geochemistry (abs). *Meteoritics & Planet. Sci.* 36, A14.  
NWA480

Barrat J.A., Blichert-Toft J., Nesbitt R.W. and Keller F. (2001c) Bulk chemistry of Saharan shergottite Dar al Gani 476. *Meteoritics & Planet. Sci.* 36, 23-29.  
DaG476

Barrat J.A., Gillet P., Sautter V., Jambon A., Javoy M., Göpel C., Lesourd M., Keller F. and Petit E. (2002a) Petrology and geochemistry of the basaltic shergottite North West Africa 480. *Meteoritics & Planet. Sci.* 37, 487-499.  
NWA480 Nakhla

Barrat J.A., Jambon A., Bohn M., Gillet Ph., Sautter V., Göpel C., Lesourd M. and Keller F. (2002b) The picritic shergottite North West Africa 1068 (NWA1068 or "Louise Michel") (abs#1538). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)  
NWA480

Barrat J.A., Jambon A., Bohn M., Gillet Ph., Sautter V., Göpel C., Lesourd M. and Keller F. (2002c) Petrology and chemistry of the picritic shergottite North West Africa 1068 (NWA 1068). *Geochim. Cosmochim. Acta* 66, 3505-3518.  
NWA1068

Barrat J.A. and six authors (2002d) Incompatible trace elements in SNCs and Li isotope systematics in a shergottite (abs). Un-mixing SNCs. 7-8. LPI Contribution No. 1134. Lunar Planetary Institute, Houston.

Barrat J.A., Benoit M. and Cotton J. (2006) Bulk chemistry of the nakhelite Miller Range 03346 (MIL 03346) (abs#1569). *Lunar Planet. Sci. Conf.* XXXVII Lunar Planetary Institute, Houston (CD-ROM)  
MIL03346

Bart G.D., Swindle T.D., Olson E.K. and Treiman A.H. (2001) Xenon and krypton in Nakhla mineral separates (abs#1363). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
Nakhla

Bartoschewitz R. and Ackermann D. (2001) Dar al Gani 876, a further fragment of the DaG-Shergottite (abs). *Meteoritics & Planet. Sci.* 36, A15.  
DaG876

Bartoschewitz R. and Appel P. (2003) Sayh al Uhaymir 150 – A further fragment of the SaU-Shergottite shower (abs). *Meteoritics & Planet. Sci.* 38, A38.  
SaU150

Basaltic Volcanism Study Team (1981) Basaltic Volcanism on the Terrestrial Planets. Pergamon Press.

New York 1286 pp, also Lunar Planetary Institute, Houston.

Basilevsky A.T., Markiewicz W.J. and Keller H.U. (1998) Morphology of rocks within and nearby rock garden: Mars Pathfinder landing site (abs#1378). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston.

Chimp Half Dome Moe Stimpy Flat Top Shark Ovoid Half Anvil

Bastien Th., Herpers U., Kubik P.W., GAMS and Michel R. (2003) Comprehensive study of cosmogenic nuclides in Martian meteorites (abs). *Meteoritics & Planet. Sci.* 38, A94.

ALH77005 ALH84001 Chassigny EETA79001A Gov. Valaders Lafayette SaU 005 Nakhla Shergotty Zagami

Basu Sarbadhikari A., Liu Y., Day J.M.D. and Taylor L.A. (2009) Olivine-hosted melt inclusions in olivine-phyric Shergottite LAR 06319 (abs#1173). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.  
LAR06319

Basu Sarbadhikari A., Day J.M.D., Liu Y and Taylor L.A. (2009) Olivine-phyric Shergottite LAR06319: Its relation to the enriched components in Martian basalts (abs#1171). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.  
LAR06319

Beard B.L., Taylor L.A., Lapen T., Mahlen N. and Johnson C.M. (2002) Hafnium and neodymium isotopic constraints on shergottite formation (abs#1933). *Lunar Planet. Sci.* XXXIII, Lunar Planetary Institute, Houston.

Beck P., Barrat J.A., Chaussidon M., Gillet P. and Bohn M. (2004a) Li isotopic variations in single pyroxenes from the Northwest Africa 480 shergottite (NWA 480): a record of degassing of Martian magma? *Geochim. Cosmochim. Acta* 68, 2925-2933.  
NWA480

Beck P., Barrat J.A., Chaussidon M., Gillet P. and Bohn M. (2004b) Li Isotopic Composition of the NWA 480 shergottite (abs). *Lunar Planet. Sci.* XXXV, Lunar Planetary Institute, Houston.  
NWA480

Beck P., Gillet P., Gautron L., Daniel I. and El Goresy A. (2004c) A new natural high-pressure (Na,Ca) hexaluminosilicate in shocked Martina meteorites. *Earth Planet. Sci. Lett.* 219, 1-12.

Beck P., Gillet P., El Goresy A. and Mostefaoui S. (2005a) Timescales of shock processes and the size of Martian meteorites source craters, constrained from shock metamorphism (abs#1333). *Lunar Planet. Sci.* XXXVI Lunar Planetary Institute, Houston.

Beck P., Barret J-A., Gillet P., Franchi I.A., Greenwood R.C., Van de Moortele B., Reynard B., Bohn M. and Cotton J. (2005b) The Diderot meteorite: the second chassignite (abs#1639). *Lunar Planet. Sci.* XXXVI CD-ROM, Lunar Planetary Institute, Houston.  
NWA2737

Beck P., Gillet P., El Goresy A. and Mostefaroui S. (2005c) Timescales of shock processes in chondritic and Martian meteorites. *Nature* 435, 1071-1074.  
Zagami

Beck P., Chaussidon M., Barrat J-A., Gillet P. and Bohn M. (2005d) An ion-microprobe study of lithium isotopes behavior in nakhrites (abs). *Meteoritics & Planet. Soc.* 40, A18.  
MIL03346

Beck P., Ferroir T., Gillet P., Montagnac G., Bohn M. and Lesourd M. (2006) Shock melting of Martian basalts and the entrapment of atmospheric gases (abs#1939). *Lunar Planet. Sci.* XXXVII Lunar Planet. Institute, Houston.  
NAW480 Zagami

Beck P., Barrat J-A., Gillet P., Wadhwa Mini, Franchi I., Greenwood R.C., Bohn M., Cotton J., Van de Moortele B. and Reynard B. (2006) Petrology and geochemistry of the chassignite Northwest Africa 2737 (NAW2737). *Geochim. Cosmochim. Acta* 70, 2127-2139.  
NWA2737

Becker L., Glavin D.P. and Bada J.L. (1997a) Polycyclic aromatic hydrocarbons (PAHs) in Antarctic Martian meteorites, carbonaceous chondrites and polar ice. *Geochim. Cosmochim. Acta* 61, 475-481.  
EETA79001 ALH84001

Becker L., McDonald G.D. and Bada J.L. (1997b) Biomarkers for analysis of Martian samples (abs). In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life.* (eds. Clifford et al.) *LPI Contribution* 916, 6. Lunar Planetary Institute, Houston.  
ALH84001 EETA79001

Becker L., McDonald G.D., Glavin D.P., Bada J.L. and Bunch T.E. (1997c) Sublimation: A mechanism for the enrichment of organics in Antarctic ice (abs). *Meteoritics & Planet. Sci.* 32, A10-11.  
ALH84001 EETA79001

Becker L., Popp B., Rust T. and Bada J.L. (1999) The origin of organic matter in the Martian meteorite ALH84001. *Earth Planet. Sci. Lett.* 167, 71-79.  
ALH84001

Becker R.H. and Pepin R.O. (1983a) Heavy nitrogen in glass from the Antarctic meteorite EETA79001 (abs). *EOS, Trans. AGU* 64, 253.  
EETA79001

Becker R.H. and Pepin R.O. (1983b) Nitrogen isotopic compositions in EETA79001 (abs). *Meteoritics* 18, 264-265.  
EETA79001

Becker R.H. and Pepin R.O. (1984) The case for a Martian origin of the shergottites: Nitrogen and noble gases in EETA79001. *Earth Planet. Sci. Lett.* 69, 225-242.  
EETA79001

Becker R.H. and Pepin R.O. (1985) Nitrogen and light noble gases in the Shergotty meteorite (abs). *Lunar Planet. Sci. XVI*, Suppl. A, 1-2. Lunar Planetary Institute, Houston.  
Shergotty

Becker R.H. and Pepin R.O. (1986) Nitrogen and light noble gases in Shergotty. *Geochim. Cosmochim. Acta* 50, 993-1000.  
Shergotty

Becker R.H. and Pepin R.O. (1993a) Nitrogen and noble gases in a glass sample from LEW88516 (abs). *Lunar Planet. Sci. XXIV*, 77-78. Lunar Planetary Institute, Houston.  
LEW88516

Becker R.H. and Pepin R.O. (1993b) Nitrogen and noble gases in a glass sample from the LEW88516 shergottite (abs). *Meteoritics* 28, 637-640.  
LEW88516

- Beckett J.R., McCanta M.C. and Stopler E.M. (2008) Phosphorus zoning in SNC olivines (abs#1726). *Lunar Planet. Sci.* XXXIX. Lunar Planet. Inst. Houston.  
Y980459 Chassigny EETA79001 RBT04262 ALH77005
- Bell J.F. (1996) Evaluating the evidence for past life on Mars. *Science* 274, 2121-2122.  
ALH84001
- Bell M.S. (2007) Experimental shock decomposition of siderite and the origin of magnetite in Martian meteorite ALH 84001. *Meteoritics & Planet. Sci.* 935-949.  
ALH84001
- Bell M.S., Thomas-Keprta K.L., Wentworth S.J. and McKay D.S. (1999a) Microanalysis of pyroxene glass in ALH84001 (abs#1951). *Lunar Planet. Sci.* XXX (CD-ROM). Lunar Planetary Institute, Houston.  
ALH84001
- Bell M.S., Thomas-Keprta K.L., Wentworth S.J. and McKay D.S. (1999b) Microanalysis of pyroxene, feldspar and silica glass in Allan Hills 84001 (abs). *Meteoritics & Planet. Sci.* 34, A10-11.  
ALH84001
- Bell M.S., McHone J., Kudryavtsev A. and McKay D.S. (1999c) Analysis of carbonates in ALH84001 Martian meteorite by Raman spectroscopy (abs). P-62, GSA, Denver.  
ALH84001
- Bell M.S., McHone J., Kudryavtsev A. and McKay D.S. (2000) Raman mapping of carbonates in ALH84001 Martain meteorite (abs# 1909). *Lunar Planet. Sci.* XXXI (CD-ROM) Lunar Planetary Institute, Houston.  
ALH84001
- Bell M.S. and McKay D.S. (2000) Alteration of an ALH84001 analog carbonate to magnetite by shock metamorphism (abs). *Geol. Soc. Amer. Abstr. Prog.* 32:7, A240.
- Bell M.S., Schwandt C., Zolensky M. and Hörz F. (2002) Experimental shock decomposition of siderite (abs). *Meteoritics & Planet. Sci.* 37, A14.
- Bell M.S., Golden D.C. and Zolensky M. (2005) Experimental shock decomposition of siderite to magnetite (abs#1851). *Lunar Planet. Sci.* XXXVI CD-ROM, Lunar Planet. Institute, Houston.
- Benoit P.H. and Tauton A.E. (1997) The challenge of remote exploration for extraterrestrial fossil life (abs). In *Instruments, Methods and Missions for the Investigation of Extraterrestrial Microorganisms*, R. Hoover ed. Proc. SPIE 3111, 98-108.  
ALH84001
- Berkley J.L. (1987) Petrology and compositional trends in five new Antarctic diogenites (abs). *Lunar Planet. Sci.* XVIII, 62-63. Lunar Planet. Institute, Houston.  
ALH84001
- Berkley J.L., Keil K., Prinz M. and Gomes C.B. (1979) The Governador Valadares nakhelite and its relationship to other nakhellites (abs). *Lunar Planet. Sci.* X, 101-103. Lunar Planet. Institute, Houston.  
Governador Valadares
- Berkley J.L., Keil K. and Prinz M. (1980) Comparative petrology and origin of Governador Valadares and other nakhellites. *Proc. Lunar Planet. Sci. Conf.* 11th, 1089-1102.  
Governador Valadares

Berkley J.L. and Keil K. (1981) Olivine orientation in the ALHA77005 achondrite. *Amer. Mineral.* 66, 1233-1236.  
ALHA77005

Berkley J.L. and Boynton N.J. (1992) Minor/major element variation within and among diogenite and howardite orthopyroxenite groups. *Meteoritics* 27, 387-394.  
ALH84001

Berkley J.L., Treiman A.H., Jones J.H. and Mittlefehldt D.W. (1999) Highly magnesian orthopyroxene xenoliths in EETA79001: Implications for Martian magmas and differentiation (abs#1588). *Lunar Planet. Sci. XXX* (CD-ROM) Lunar Planetary Institute, Houston.  
EETA79001

Berkley J.L., Treiman A.H. and Jones J.H. (2000) Petrologic history of a complex pyroxene xenolith in EETA79001 Martian meteorite (abs# 1729). *Lunar Planet. Sci. XXXI* (CD-ROM) Lunar Planetary Institute, Houston.  
EETA79001

Bertka C.M. and Fei Y. (1997) Mineralogy of the Martian interior up to core-mantle boundary pressures. *J. Geophys. Res.* 102, 5251-5264.

Bertka C.M. and Holloway J.R. (1988) Martian mantle primary melts: An experimental study of iron-rich garnet lherzolite minimum melt composition. *Proc. Lunar Plant. Sci. Conf.* 18<sup>th</sup>, 723-739. Lunar Planetary Institute, Houston.

Berwerth F. (1912) Min. Petr. Mitt. (Tschermark) vol. xxxi, 107.  
Nakhla

Bhandari N., Bhat S.G., Lal D., Rajagopalan G., Tamhane A.S. and Venkatavaradan V.S. (1971) Superheavy elements in extraterrestrial samples. *Nature* 230, 219-224.  
Nakhla

Bhandari N. *et al.* (1980) Calculation of atmospheric ablation based on cosmic ray tracks and Ne isotopes *Nuclear Tracks* 4, 213.  
Nakhla Chassigny

Bhandari N., Sen Gupta D., Jha R. and Goswami J.N. (1985) TL and nuclear track studies in Shergotty and other SNC meteorites (abs). *Lunar Planet. Sci. XVI*, Suppl. A, 3-4. Lunar Planetary Institute, Houston.  
Shergotty ALHA77005 EETA79001

Bhandari N., Goswami J.N., Jha R., Sen Gupta D. and Shukla P.N. (1986) Cosmogenic effects in shergottites. *Geochim. Cosmochim. Acta* 50, 1023-1030.  
Shergotty ALHA77005 EETA79001

Binns R.W. (1967) Stoney meteorites bearing maskelynite. *Nature* 214, 1111-1112.  
Shergotty Zagami

Birck J.L. and Allègre C.L. (1994) Contrasting Re/Os magmatic fractionation in planetary basalts. *Earth Planet. Sci. Lett.* 124, 139-148.  
Nakhla Chassigny

Bishoff A. and Stöffler D. (1992) Shock metamorphism as a fundamental process in the evolution of planetary bodies: Information from meteorites. *Eur. J. Minerals.* 4, 707-755.

ALHA77005

Bishop J.L., Pieters C.M., Mustard J., Pratt S. and Hiroi T. (1994) Spectral analyses of ALH84001, a meteorite from Mars (abs). *Meteoritics* 29, 444-445.  
ALH84001

Bishop J.L. and Pieters Carle M. (1996) Spectral analysis of the Martian meteorite ALH84001 (abs).  
*Meteoritics & Planet. Sci.* 31, A15-A16.  
ALH84001

Bishop J.L., Pieters C.M. and Hiroi T. (1997a) Spectroscopic properties of Martian meteorite ALH84001 and identification of minerals and organic species (abs). *Lunar Planet. Sci.* XXVIII, 117-118. Lunar Planetary Institute, Houston  
ALH84001

Bishop J.L., Pieters C.M. and Hiroi T. (1997b) The source of organic spectral features in Allan Hills 84001: Lab contamination, terrestrial, or extraterrestrial? (abs) *Meteoritics & Planet. Sci.* 32, A14-15.  
ALH84001

Bishop J.L., Mustard J.F., Pieters C.M. and Hiroi Taka (1998a) Recognition of minor constituents in reflectance spectra of Allan Hills 84001 chips and the importance for remote sensing on Mars.  
*Meteoritics & Planet. Sci.* 33, 693-998.  
ALH84001

Bishop J.L., Pieters C. M., Hiroi T. and Mustard J. F. (1998b) Spectroscopic analysis of Martian meteorite Allan Hills 84001 powder and applications for spectral identification of minerals and other soil components on Mars. *Meteoritics & Planet. Sci.* 33, 699-707.  
ALH84001

Bishop J.L., Pieters C. M., Mustard J.F. and Hiroi T. (1999) Spectral identification of major and minor constituents of Martian meteorite ALH84001 and the implications for remote sensing on Mars (abs#2038). *Lunar Planet. Sci.* XXX, (CD-ROM). Lunar Planetary Institute, Houston.  
ALH84001

Bishop J.L. and Hamilton Vicky E. (2001) Reflectance and emittance spectra of Martian meteorites (abs).  
*Meteoritics & Planet. Sci.* 36, A21-22.  
Los Angeles ALH84001 EETA79001

Biswas S., Ngo H.T. and Lipschutz M.E. (1980) Trace element contents of selected Antarctic meteorites, I: Weathering effects and A77005, A77257, A77278 and A77299. *Zeitschrift für Naturforschung*, 35a, 191-196.  
ALHA77005

Blake D.F., Treiman A.H., Cady S., Nelson C. and Krishnan K. (1998) Characterization of magnetite within carbonate in ALH84001 (abs#1347). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Blake D.F., Treiman A.H., Amundsen H.E.F., Mojzsis S.J. and Bunch T. (1999) Carbonate globules, analogous to those in ALH84001, from Spitzbergen Norway: Formation in a hydrothermal environment (abs#1683). *Lunar Planet. Sci.* XXX, (CD-ROM) Lunar Planetary Institute, Houston.  
ALH84001

Bland P.A., Menzies O.N., Sheller T., Berry F.J. and Grady M.M. (2003) Fe-Mg composition and modal abundance of Martian silicates by Moessbauer spectroscopy (abs). *Meteoritics & Planet. Sci.* 66<sup>th</sup>

Meteoritical Society Meeting, Munster.

Blaess U. and Langenhorst F. (2007) Sock metamorphism of late crystallization products in Shergotty (abs#5309). *Meteoritics & Planet. Sci.* 42, A19.

Blichert-Toft J., Gleason J.D., Albarede F., Kring D.A., Hill D.H. and Boynton W.V. (1998a) The Hf isotopic compositions of Zagami and QUE94201: A garnet-free depleted Martian mantle (abs#1074). *Lunar Planet. Sci. XXIX* Lunar Planetary Institute, Houston (CD-ROM).  
Zagami QUE94201

Blichert-Toft J., Albarede F., Gleason J.D., Kring D.A., Hill D.H. and Boynton W.V. (1998b) Martian mantle evolution from the hafnium isotopic perspective (abs). *Meteoritics & Planet. Sci.* 33, A16-17.

Blichert-Toft J., Gleason J.D., Telouk P. and Albarede F. (1999) The Lu-Hf isotope geochemistry of shergottites and the evolution of the Martian mantle-crust system. *Earth Planet. Sci. Lett.* 173, 25-39.  
Zagami Shergotty ALH77005 EETA79001 QUE94201

Blichert-Toft J., Bouvier A., Vervoort J.D., Gillet P. and Albarede F. (2007) Old shergottites and young impact ages (abs#5229). *Meteoritics & Plant. Sci.* 42, A20.

Blinova A. and Herd C.D.K. (2008) Phase relations and experimental REE partitioning using a primitive Martian basalt composition at high pressure (abs#1059). *Lunar Planet. Sci. XXXIX* Lunar Planetary Institute, Houston (CD-ROM).  
Y980459

Boctor N.W., Meyer H.O. and Kullerud G. (1976) Lafayette meteorite: Petrology and opaque mineralogy. *Earth Planet. Sci. Lett.* 32, 69-76.  
Lafayette

Boctor N.Z., Fei Y., Bertka C.M., D'Alexander C.M.O. and Hauri E. (1998) Vitrification and high pressure phase transition in olivine megacrysts from lithology A in Martian meteorite EETA79001 (abs#1492). *Lunar Planet. Sci. XXIX* Lunar Planetary Institute, Houston (CD-ROM).  
EETA79001

Boctor N.Z., Wang J., D'Alexander C.M.O., Hauri E., Bertka C.M., Fei Y. and Humayun M. (1998a) Petrology and hydrogen and sulfur isotope studies of mineral phases in Martian meteorite ALH84001 (abs#1787). *Lunar Planet. Sci. XXIX* Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Boctor N.Z., Wang J., D'Alexander C.M.O., Hauri E., Bertka C.M. and Fei Y. (1998b) Hydrogen isotopic studies of carbonate and phosphate in Martian meteorite ALH84001 (abs). *Meteoritics & Planet. Sci.* 33, A18-19.  
ALH84001

Boctor N.Z., Fei Y., Bertka C.M., D'Alexander C.M.O. and Hauri E. (1998c) Shock metamorphic features in lithologies A, B, and C of Martian meteorite EETA79001 (abs). *Meteoritics & Planet. Sci.* 33, A18.  
EETA79001

Boctor N.Z., Fei Y., Bertka C.M., D'Alexander C.M.O. and Hauri E. (1999a) Shock metamorphic effects in Martian meteorite ALHA77005 (abs#1628). *Lunar Planet. Sci. XXX* (CD-ROM). Lunar Planetary Institute, Houston.  
ALHA77005

Boctor N. Z., Wang J., D'Alexander C. M. O., Hauri E., Bertka C. M. and Fei Y. (1999b) Hydrogen-

isotopic studies of feldspathic and mafic glasses in Martian meteorites ALH84001 and EETA 79001 (abs#1397). *Lunar Planet. Sci.* XXX, (CD-ROM). Lunar Planetary Institute, Houston.  
ALH84001 EETA79001

Boctor N. Z., Wang J., D'Alexander C.M.O. and Hauri E. (1999c) Hydrogen-isotopic studies of carbonate and feldspathic and mafic glass in Martian meteorites Allan Hills 84001 and Elephant Moraine 79001 (abs). *Meteoritics & Planet. Sci.* 34, A14.  
ALH84001 EETA79001

Boctor N. Z., D'Alexander C.M.O., Wang J. and Hauri E. (2000a) Hydrogen isotopic studies of mafic, feldspathic, and melt inclusion glasses in Martain meteorite Alan Hills 77005 (abs# 1759). *Lunar Planet. Sci.* XXXI, (CD-ROM). Lunar Planetary Institute, Houston.  
ALH77005

Boctor N. Z., D'Alexander C.M.O., Wang J. and Hauri E. (2000b) Hydrogen-isotopic investigations of minerals and glasses in the Martian meteorite Chassigny (abs). *Meteoritics & Planet. Sci.* 35, A29. Chassigny

Boctor N. Z., D'Alexander C.M.O., Wang J. and Hauri E. (2001a) Hydrogen isotope studies ofwater-bearing post-stishovite silica phase and feldspathic glass in the Martian meteorites Shergotty and Zagami (abs#1309). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
Shergotty Zagami

Boctor N.Z., D'Alexander C.M.O., Wang J. and Hauri E. (2001b) Shock metamorphic effects and hydrogen isotope study of the Martian meteorite Sayh al Uhaymir 005 (abs). *Meteoritics & Planet. Sci.* 36, A23.  
SaU005

Boctor N.Z., D'Alexander C.M.O., Wang J. and Hauri E. (2001c) The source of extraterrestrial water in Marian meteorites: clues from hydrogen isotopic composition of impact-melted glasses and magmatic melt-inclusion glasses (abs). 11<sup>th</sup> Goldschmidt Conf. 3343. Hot Springs.

Boctor N.Z., D'Alexander C.M.O., Wang J. and Hauri E. (2002a) H isotopic signatures of minerals, melt inclusions, and impact glasses in SNC meteorites (abs). 12<sup>th</sup> Goldschmidt Conf. *Geochim. Cosmochim. Acta* 66, A85.

Boctor N.Z., Wang J., D'Alexander C.M.O. and Hauri E. (2002b) D/H of minerals and melt inclusions in the SNCs Nakhla and Governador Valadares (abs). *Meteoritics & Planet. Sci.* 37, A19.  
Nakhla Governador Valadares

Boctor N.Z., D'Alexander C.M.O., Wang J. and Hauri E. (2003) The sources of water in Martian meteorites: Clues from hydrogen isotopes. *Geochim. Cosmochim. Acta* 67, 3971-3989.

Boctor N.Z., Wang J., D'Alexander C.M.O., Hauri E. and Irving A.J. (2005a) SIMS analysis of volatiles and H isotope studies of the nakhrites Yamato 000593 and NWA 998 (abs#1639). *Lunar Planet. Sci.* XXXVI CD-ROM, Lunar Planet. Institute, Houston.  
Y000593 NWA998

Boctor N.Z., Wang J., D'Alexander C.M.O., Hauri E. and Irving A.J. (2005b) Volatile abundances in minerals and glases from the nakhrites and the shergottite Zagami (abs). *Meteoritics & Planet. Soc.* 40, A21.  
Zagami

Boctor N.Z., Wang J., D'Alexander C.M.O. and Hauri E. (2006) Volatile abundances and hydrogen isotope signatures of melt inclusions and nominally anhydrous minerals in the chassignites and

ALH84001 (abs#1412). *Lunar Planet. Sci.* XXXVII Lunar Planet. Institute, Houston  
ALH84001

Boctor N.Z. and D'Alexander C.M.O. (2007) Volatile abundances and H isotope signature of feldspathic glass and clinopyroxene in the Shergottites Zagami, EETA79001, Shergotty and ALH77005 (abs#1801). *Lunar Planet. Sci.* XXXVIII Lunar Planet. Institute, Houston  
Zagami EETA79001 Shergotty ALH77005

Bodnar R.J. (1999) Fluid inclusions in ALH84001 and other Martian meteorites: Evidence for volatiles on Mars (abs#1222). *Lunar Planet. Sci.* XXX, (CD-ROM). Lunar Planetary Institute, Houston.  
ALH84001 Nakhla

Bogard D.D. (1982) Trapped noble gases in the EETA79001 shergottite (abs). *Meteoritics* 17, 185.  
EETA79001

Bogard D.D. (1983a) Martian atmospheric gases trapped in the EETA79001 shergottite? *Proc. NIPR Sym. Antarctic Meteorites* 8th, 79-80. Nat. Inst. Polar Res., Tokyo. (*see address in Appendix III*)  
EETA79001

Bogard D.D. (1993b) A meteorite from the Moon. *Geophys. Res. Lett.* 10, 773. (editorial)

Bogard D.D. (1984) On the origin of excess  $^{40}\text{Ar}$  in the four shergottite-achondrites (abs). *Meteoritics* 19, 195.  
Shergotty Zagami ALHA77005 EETA79001

Bogard D.D. (1995) Exposure-age-initiating events for Martian meteorites: Three or four? (abs) *Lunar Planet. Sci.* XXVI, 143-144. Lunar Planetary Institute, Houston.  
Nakhla Chassigny ALH84001

Bogard D.D. (1997a) A reappraisal of the Martian  $^{36}\text{Ar}/^{38}\text{Ar}$  ratio. *J. Geophys. Res.* 102, 1653-1661.  
EETA79001

Bogard D.D. (1997b) Martian volatiles and isotopic signatures. In *Mars 2005 sample return workshop*. (ed. Gulick) *LPI Tech. Rpt.* 97-1, 57-63. Lunar Planetary Institute, Houston.

Bogard Don D. and Husain L. (1977) A new 1.3 aeon-young achondrite. *Geophys. Res. Lett.* 4, 69-71.  
Governador Valadares

Bogard D.D. and Husain L. (1978)  $^{40}\text{Ar}-^{39}\text{Ar}$  dating of shock events in the Shergotty achondrite and the Plainview chondrite. In *Short Papers of the 4th ICOG* (ed. Zartman). *USGS Open file report* 78-701, 43-45.  
Shergotty

Bogard D.D., Husain L. and Nyquist L.E. (1979a)  $^{40}\text{Ar}/^{39}\text{Ar}$  age of the Shergotty achondrite and implications for its post-shock thermal history. *Geochim. Cosmochim. Acta* 43, 1047-1055.  
Shergotty

Bogard D.D. and Nyquist L.E. (1979b)  $^{39}\text{Ar}/^{40}\text{Ar}$  chronology of related achondrites (abs). *Meteoritics* 14, 356.  
ALHA77005 Chassigny Shergotty Zagami

Bogard D.D., Duke M.B., Gibson E.K., Jr., Minear J.W., Nyquist L.E. and Phinney W.C. (1979c) *Consideration of sample return and the exploration strategy for Mars.* NASA Tech. Memo. 58213, Johnson Space Center, Houston.

Bogard D.D. and Johnson P. (1983a) Martian gases in an Antarctic meteorite? *Science* 221, 651-654.  
EETA79001

Bogard D.D. and Johnson P. (1983b) Martian atmospheric gases trapped in the EETA79001 shergottite?  
(abs) *Lunar Planet. Sci.* XIV, 53-54. Lunar Planetary Institute, Houston.  
EETA79001

Bogard D.D., Johnson P. and Nyquist L.E. (1984a) Cosmic ray exposure of SNC achondrites and  
constraints on their derivation from Mars (abs). *Lunar Planet. Sci.* XV, 68-69. Lunar Planetary  
Institute, Houston.

Nakhla Governador Valadares Lafayette Chassigny Shergotty Zagami ALHA77005  
EETA79001

Bogard D.D., Nyquist L.E. and Johnson P. (1984b) Noble gas contents of shergottites and implications for  
the Martian origin of SNC meteorites. *Geochim. Cosmochim. Acta* 48, 1723-1739.  
EETA79001 Zagami ALHA77005 Shergotty Chassigny Nakhla Lafayette

Bogard D.D. and Hörz F. (1986) Shock-implanted noble gases: An experimental study with implications  
for the origin of Martian gases in shergottite meteorites (abs). *Meteoritics* 21, 337-338.

Bogard D.D., Hörz F., Johnson P. and Schmidt R. (1986a) Noble gases implanted by artificial shock:  
Implications for trapped Martian gases in the EETA79001 meteorite (abs). *Lunar Planet. Sci.* XVII,  
64-65. Lunar Planetary Institute, Houston.  
EETA79001

Bogard D.D., Hörz F. and Johnson P. (1986b) Shock-implanted noble gases: An experimental study with  
implications for the origin of Martian gases in shergottite meteorites. *Proc. Lunar Planet. Science  
Conf.* 17th ; *J. Geophys. Res.* 91 (suppl.), E99-E114.

Bogard D.D., Hörz F. and Johnson P. (1989) Shock-implanted noble gases II: Additional experimental  
studies and recognition in naturally shocked terrestrial materials. *Meteoritics* 24, 113-123.

Bogard D.D. and Garrison D.H. (1993) Noble gases in LEW88516 shergottite: Evidence for exposure age  
pairing with ALHA77005 (abs). *Lunar Planet. Sci.* XXIV, 139-140. Lunar Planetary Institute,  
Houston.  
LEW88516 ALHA77005

Bogard D.D. and Garrison D.H. (1997)  $^{39}\text{Ar}$ - $^{40}\text{Ar}$  age of ALH 84001 (abs). In *Conference on Early  
Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications  
for life.* (eds. Clifford *et al.*) *LPI Contribution* 916, 10. Lunar Planetary Institute, Houston.  
ALH84001

Bogard D.D. and Garrison D.H. (1998a) Composition of Martian noble gases trapped in Martian meteorite  
impact glasses (abs#1076). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-  
ROM).  
Shergotty Y793605 EETA79001

Bogard D.D. and Garrison D.H. (1998b) Relative abundances of Ar, Kr and Xe in the Martian  
atmosphere as measured in Martian meteorites. *Geochim. Cosmochim. Acta* 62, 1829-1835.  
Shergotty Y793605 EETA79001

Bogard D.D. and Garrison D.H. (1998c) Trapped and radiogenic argon in Martian shergottites (abs).  
*Meteoritics & Planet. Sci.* 33, A19.

- Bogard D.D. and Garrison D.H. (1999) Argon-39-argon-40 “ages” and trapped argon in Martian shergottites, Chassigny and Allan Hills 84001. *Meteoritics & Planet. Sci.* 34, 451-473.  
Chassigny ALLH84001 EET79001 Y793605 Shergotty Zagami QUE94201 ALH77005
- Bogard D.D., Clayton R.N., Marti K., Owen T. and Turner G. (2001) Martian volatiles: Isotopic composition, origin and evolution. In Chron. & Evol. of Mars (ISSI) 96, 425-458. Kluwer Academic Publishers. The Netherlands. (*a review*)
- Bogard D.D. and Garrison Dan H. (2005)  $^{39}\text{Ar}$ - $^{40}\text{Ar}$  ages and trapped Ar in Martian nakhlites and chassignites (abs). *Meteoritics & Planet. Sci.* 40, A22.
- Bogard Don D. and Garrison D.H. (2006) Ar-Ar dating of Martian chassignites, NWA2737 and Chassigny, and nakhlite MIL03346 (abs#1108). *Lunar Planet. Sci. XXXVII*, Lunar Planetary Institute, Houston. (CD-ROM)  
Chassigny NWA2737 MIL03346
- Bogard D.D. and Park Jisun (2007) Excess 40Ar in the Zagami shergottite: Does it reveal crystallization history? (abs#5014) *Meteoritics & Planet. Sci.* 42, A21.  
Zagami
- Bogard D.D. and Park J. (2008) Excess 40Ar in Martian shergottites, K40-Ar ages of nakhlites, and implications of *in situ* K-Ar dating of Mars’ surface rocks (abs#1100). *Lunar Planet. Sci. XXXVII* Lunar Planetary Institute, Houston (CD-ROM)
- Bogard D.D. and Park J. (2008) 39Ar- 40Ar of the Zagami Martian shergottite and implications for the magam origin of excess 40Ar. *Meteoritics & Planet. Sci.* 43, 1113-1126.  
Zagami
- Bogard D.D. and Garrison D.H. (2008) 39Ar-40Ar age and thermal history of Martian dunite NWA 2737. *Earth Planet. Sci. Lett.* 273, 386-392.  
NWA 2737
- Borg Lars E., Nyquist L.E., Wiesmann H. and Shih ChiYu. (1996) Rb-Sr age and initial  $^{87}\text{Sr}/^{86}\text{Sr}$  of basaltic shergottite QUE94201 (abs). *Meteoritics & Planet. Sci.* 31, A18-A19.  
QUE94201
- Borg L.E., Nyquist Larry E., Taylor L A., Wiesmann H. and Shih C.-Y. (1997a) Rb-Sr and Sm-Nd isotopic analyses of QUE94201: Constraints on Martian differentiation processes (abs). *Lunar Planet. Sci. XXVIII*, 133-134. Lunar Planetary Institute, Houston (CD-ROM)  
QUE94201
- Borg L.E., Nyquist L.E., Taylor L.A., Wiesmann H. and Shih C.-Y. (1997b) Constraints on Martian differentiation processes from Rb-Sr and Sm-Nd isotopic analyses of the basaltic shergottite QUE94201. *Geochim. Cosmochim. Acta* 61, 4915-4931.  
QUE94201
- Borg L.E., Nyquist L.E. and Wiesmann Henry (1998a) Rb-Sr isotopic systematics of the lherzolitic shergottite LEW88516 (abs#1233). *Lunar Planet. Sci. XXIX* Lunar Planetary Institute, Houston (CD-ROM).  
LEW88516
- Borg L.E., Nyquist L.E., Wiesmann H. and Reese Young (1998b) Samarium-neodymium isotopic systematics of the lherzolitic shergottite Lewis Cliff 88516 (abs). *Meteoritics & Planet. Sci.* 33, A20.  
LEW88516

Borg L.E., Nyquist L.E., Shih C-Y., Wiesmann H., Reese Y. and Connelly J.N. (1998c) Rb-Sr formation age of ALH 84001 carboantes (abs). Workshop on the Issue Martian Meteorites: Where - - - #7030. Lunar Planetary Institute, Houston.  
ALH84001

Borg L.E., Connelly J.N., Nyquist L.E. and Shih C.-Y. (1999a) Pb-Pb age of the carbonates in the Martian meteorite ALH84001 (abs#1430). *Lunar Planet. Sci. XXX* (CD-ROM) Lunar Planetary Institute, Houston.  
ALH84001

Borg L.E., Connelly J. N., Nyquist L.E., Shih C.-Y., Wiesmann H. and Reese Y. (1999b) The age of the carbonates in the Martian meteorite ALH84001. *Science* 286, 90-94.  
ALH84001

Borg L.E., Nyquist L. E., Weismann H., Reese Y. and Papike J.J. (2000) Sr-Nd isotopic systematics of Martian meteorite DaG476 (abs#1036). *Lunar Planet. Sci. XXXI* (CD-ROM) Lunar Planetary Institute, Houston.  
DaG476

Borg and seven authors (2001a) The age of Dhofar 019 and its relationship to the other Martian meteorites. (abs#1144). *Lunar Planet. Sci. XXXII* Lunar Planetary Institute, Houston (CD-ROM)  
Dho019

Borg L.E., Nyquist L.E., Wiesmann H. and Reese Y. (2001b) Rubidium-strontium and Samarium-neodymium isotopic systematics of the Lherzolitic shergottites ALH77005 and LEW88516: Constraints on the petrogenesis of Martian meteorites (abs). *Meteoritics & Planet. Sci.* 36, A25.  
ALH77005 LEW88516

Borg L.E., Nyquist L.E., Wiesmann H. and Reese Y. (2002a) Constraints on the petrogenesis of Martian meteorites from the Rb-Sr and Sm-Nd isotopic systematics of the lherzolitic shergottites ALH77005 and LEW88516. *Geochim. Cosmochim. Acta* 66, 2037-2053.  
ALH77005 LEW88516

Borg Lars E. (2002b) Exploring trace element and isotopic mixing relationships in the Martian meteorite suite (abs). Un-mixing SNCs. 9-10. LPI Contribution No. 1134. Lunar Planetary Institute, Houston

Borg L.E., Asmerom Y. and Edmunson J.E. (2003a) Uranium-Lead isotopic systematics of the Martian meteorite Zagami (abs#1107). *Lunar Planet. Sci. XXXIV* Lunar Planetary Institute, Houston  
Zagami

Borg L.E. and Draper D.S. (2003b) A petrological model for the origin of Martian shergottite magmas based on their major element, trace element, and isotopic compositions (abs#1169). *Lunar Planet. Sci. XXXIV* Lunar Planetary Institute, Houston

Borg L.E. and Draper D.S. (2003c) A petrological model for the origin and compositional variations of the Martian basaltic meteorites. *Meteoritics & Planet. Sci.* 38, 1713-1732.

Borg L.E., Nyquist L.E., Wiesmann H., Shih C-Y. and Reese Y. (2003d) The age of Dar al Gani 476 and the differentiation history of the Martian meteorites inferred from their radiogenic isotopic systematics. *Geochim. Cosmochim. Acta* 67, 3519-3536.  
DaG476

Borg L.E. and Drake M.J. (2005) A review of meteorite evidence for the timing of magmatism and of surface or near-surface liquid water on Mars. *J. Geophys. Res.* 110, E12S03

Borg L.E., Edmundson J.E. and Asmerom Y. (2005) Constraints on the U-Pb isotopic systematics of Mars inferred from a combined U-Pb, Rb-Sr and Sm-Nd isotopic study of the Martian meteorite Zagami. *Geochim. Cosmochim. Acta* 69, 5819-5830.  
Zagami

Borg L.E., Gaffney A.M. and DePaolo D. (2008) Preliminary age of Martian meteorite Northwest Africa 4468 and its relationship to the other incompatible-element-enriched shergottites (abs#1851). *Lunar Planet. Sci. XXXIX* Lunar Planetary Institute, Houston.  
NWA4468

Bouvier A., Blichert-Toft Janne, Vervoort J. and Albarede F. (2005a) The age of Zagami and other shergottites (abs). *Meteoritics & Planet. Sci.* 40, A23.

Bouvier Audrey, Blichert-Toft J., Vervoot J.D. and Alberede F. (2005b) The age of SNC meteorites and the antiquity of the Martian surface. *Earth Planet. Sci. Lett.* 240, 221-233.  
Zagami DaG476 Los Angeles Nakhla

Bouvier A. Blichert-Toft J., Vervoot Jeffrey D., Gillet P. and Alberede F. (2005b) The case for old basaltic shergottites. *Earth Planet. Sci. Lett.* 266, 105-124.

Boynton W.V., Starzyk P.M. and Schmitt R.A. (1976) Chemical evidence for the genesis of the ureilites, the achondrite Chassigny and the nakhrites. *Geochim. Cosmochim. Acta* 40, 1439-1447.  
Chassigny

Boynton W.V., Hill D.H. and Kring D.A. (1992) The trace-element composition of LEW88516 and its relationship to SNC meteorites (abs). *Lunar Planet. Sci. XXIII*, 147-148. Lunar Planetary Institute, Houston.  
LEW88516

Bradley J.P., Harvey R.P. and McSween H.Y. (1996) Magnetite whiskers and platelets in the ALH84001 Martian meteorite: Evidence of vapor phase growth. *Geochim. Cosmochim. Acta* 60, 5149-5155.  
ALH84001

Bradley J.P., Harvey R.P. and McSween H.Y. (1997a) Magnetite whiskers and platelets in the ALH84001 Martian meteorite: Evidence of vapor phase growth (abs). *Lunar Planet. Sci. XXVIII*, 147-148.  
Lunar Planetary Institute, Houston  
ALH84001

Bradley J.P., McSween H.Y. and Harvey R.P. (1997b) Epitaxial growth of single-domain magnetite in Martian meteorite Allan Hills 84001 (abs). *Meteoritics & Planet. Sci.* 32, A20.  
ALH84001

Bradley J.P., Harvey R.P. and McSween H.Y. (1997c) No ‘nanofossils’ in Martian meteorite. *Nature* 390, 454.  
ALH84001

Bradley J.P., McSween H.Y. and Harvey R.P. (1998a) Mechanisms of formation of magnetite in Martian meteorite ALH84001 (abs#1757). *Lunar Planet. Sci. XXIX* Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Bradley J.P., McSween H.Y. and Harvey Ralph P. (1998b) Epitaxial growth of nanophase magnetite in Martian meteorite Allan Hills 84001: Implications for biogenic mineralization. *Meteoritics & Planet. Sci.* 33, 765-773.  
ALH84001

- Bradley J.P. (1999) Investigation of biomineralization at the nanometer scale by using electron microscopy. In Knoll *et al.* (1999)  
ALH84001
- Brandenburg J.E. (1994) Constraints on the Martian cratering record based on the SNC meteorites and implications for the Mars climatic history. *Earth, Moon and Planets* 67, 35-45.
- Brandenburg J.E. (1998) The CI as the missing old meteorites of Mars: New data (abs#1728). *Lunar Planet. Sci. XXIX* Lunar Planetary Institute, Houston (CD-ROM).
- Brandon A.D., Walker R.J., Morgan J.W. and Goles G.G. (1997) Rhenium-187/Osmium-187 isotopic constraints on the chemical evolution of the Martian mantle (abs). *7th Goldschmidt Conf., LPI Contribution* 921, 35. Tucson.
- Brandon A.D., Walker R.J., Morgan J.W. and Goles G.G. (1998) Re-Os isotopic constraints on the chemical evolution and differentiation of the Martian mantle (abs#1279). *Lunar Planet. Sci. XXIX* Lunar Planetary Institute, Houston (CD-ROM).
- Brandon A.D., Walker R.J., Morgan J.W. and Goles G.G. (2000a) Re-Os isotopic evidence for early differentiation of the Martian mantle (abs#1676). *Lunar Planet. Sci. XXXI*, (CD-ROM). Lunar Planetary Institute, Houston.  
Nakhla Chassigny DaG476 ALH77005 LEW88516 Y793605 Zagami EETA79001
- Brandon A.D., Walker R.J., Morgan J.W. and Goles G.G. (2000b) Re-Os isotopic evidence for early differentiation of the Martian mantle. *Geochim. Cosmochim. Acta* 64, 4083-4095.  
Nakhla Chassigny DaG476 ALH77005 LEW88516 Y793605 Zagami EETA79001
- Brandon A.D., Nyquist L.E., Shih C-Y. and Wiesmann H. (2004) Rb-Sr and Sm-Nd isotopic systematics of shergottite NWA 856: Crystallization age and implications for alteration of hot desert SNC meteorites (abs#1931). *Lunar Planet. Sci. XXXV* (CD-ROM) Lunar Planetary Institute, Houston.  
NWA856
- Brandon A.D., Walker R.J., Putchel I.S. and Irving A.J. (2008) Re-Os isotopic systematics of the shergottite ‘depleted’ end-member (abs#1404). *Lunar Planet. Sci. XXXIX* (CD-ROM) Lunar Planetary Institute, Houston.  
Dho019 SaU005 DaG476 NWA1195 Y980459
- Brearley A.J. (1991) Subsolidus microstructures and cooling history of pyroxenes in the Zagami shergottite (abs). *Lunar Planet. Sci. XXII*, 135-136. Lunar Planetary Institute, Houston.  
Zagami
- Brearley A.J. (1998a) Magnetite in ALH84001: Product of the decomposition of ferroan carbonate (abs#1451). *Lunar Planet. Sci. XXIX* Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001
- Brearley A.J. (1998b) Microstructures of feldspathic glass in ALH84001 and evidence for post carbonate formation shock melting.(abs#1452). *Lunar Planet. Sci. XXIX* Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001
- Brearley A.J. (1998c) Rare K-bearing mica in ALH84001: Additional constraints on carbonate formation (abs). *Workshop on the Issue Martian Meteorites: Where - - - #7019*. Lunar Planetary Institute, Houston.  
ALH84001

Brearley A.J. (2000) Hydrous phases in ALH84001: Further evidence for preterrestrial alteration and a shock-induced thermal overprint (abs# 1203). *Lunar Planet. Sci.* XXXI, (CD-ROM). Lunar Planetary Institute, Houston.  
ALH84001

Brearley A.J. (2003) Magnetite in ALH84001: An origin by shock-induced thermal decomposition of iron carbonate. *Meteoritics & Planet. Sci.* 38, 849-870.  
ALH84001

Brett Robin (1974) *On the petrological, geochemical and geophysical characterization of a returned Mars surface sample and the impact of biological sterilization on the analyses.* NASA Johnson Space Center, Houston.

Bridges J.C., Franchi I.A., Grady M.M., Sexton A.S. and Pillinger C.T. (1997) The  $\delta^{18}\text{O}$  composition of feldspar and other minerals in Lafayette (abs). *Meteoritics & Planet. Sci.* 32, A21.  
Lafayette

Bridges J.C. and Grady M.M. (1998a) Melted sediment from Mars in Nakhla (abs#1399). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
Nakhla

Bridges J.C. and Grady M.M. (1998b) Traces of Martian sediment in Nakhla and other SNC meteorites (abs). *Meteoritics & Planet. Sci.* 33, A23.  
Nakhla

Bridges J.C. and Grady M.M. (1999a) Siderite and gypsum intergrowths with magnetite-ilmenite in Governador Valadares (abs#1545). *Lunar Planet. Sci.* XXX, (CD-ROM). Lunar Planetary Institute, Houston.  
Governador Valadares

Bridges J.C. and Grady M.M. (1999b) Evaporite mineral assemblages in Lafayette and the Nakhrites (abs). *Meteoritics & Planet. Sci.* 34, A18-19.  
Lafayette Nakhla Governador Valadares

Bridges J.C. and Grady M.M. (1999c) A halite-siderite-anhydrite-chloroapatite assemblage in Nakhla: Mineralogical evidence for evaporites on Mars. *Meteoritics & Planet. Sci.* 34, 407-415.  
Nakhla

Bridges J.C., Smith M.P. and Grady M.M. (2000) Progressive evaporation and relict fluid inclusions in the nakhrites (abs#1590). *Lunar Planet. Sci.* XXXI (CD-ROM). Lunar Planetary Institute, Houston.  
Nakhla

Bridges J.C. and Grady M.M. (2000) Evaporite mineral assemblages in the Nakhla (martian) meteorite. *Earth Planet. Sci. Lett.* 176, 267-279.  
Nakhla Governador Valadaras Lafayette

Bridges J.C. and Grady M.M. (2001) Chromite chemistry in SNC meteorites (abs). *Meteoritics & Planet. Sci.* 36, A30.  
ALH84001 DaG476 Chassigny Shergotty SaU005 EETA79001

Bridges J.C., Catling D.C., Saxton J.M., Swindle T.D., Lyon I.C. and Grady M.M. (2001) Alteration assemblages in Martian meteorites: Implications for near-surface processes. *Space Science Rev.* 96, 365-392.

- Bridges J.C., Schofield P.F., Smith A.D., Scholl A. and Grady M.M. (2002) Chemistry and valency spectra of chromite in SNC meteorites (abs#1695). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)
- Bridges J.C., Jeffries T.E. and Grady M.M. (2003) Chemical fractionation and alteration trends between five nakhlites (abs). *Meteoritics & Planet. Sci.* 38, A119.
- Bridges J.C., Warren P.H. and Lee M.R. (2004) Olivine decomposition features in the Y-000593 and NWA 998 nakhlites (abs). *Meteoritics & Planet. Sci.* 39, A18.  
Y000593 NWA998
- Bridges J.C., James R.H., Pearson V.K., Baker I., Verchovsky A.B. and Wright I.P. (2005) Lithium and carbon isotopic fractioations between the alteration assemblages of Nakhla and Lafayette (abs#1758). *Lunar Planet. Sci.* XXXVI (CD-ROM) Lunar Planet. Institute, Houston.  
Nakhla Lafayette
- Browning L.B. and Bourcier W.L. (1997) Did the porous carbonate regions in ALH84001 form by low temperature inorganic processes? (abs) *Lunar Planet. Sci.* XXVIII, 161. Lunar Planet. Institute, Houston.  
ALH84001
- Bruckner J., Dreibus G., Rieder R. and Wanke H. (2003) Refinded data of Alpha Proton X-ray Spectrometer analysis pf soils and rocks at the Mars Pathfinder site: implications for surface chemistry. *J. Geophys Res.* 108, (12), 8094.
- Bull R.K. and Durrani S.A. (1981) ALHA77005: Uranium content of phosphates and thermoluminscence studies (abs). *Lunar Planet. Sci.* XII, 118-119. Lunar Planetary Institute, Houston  
ALHA77005
- Bullock M.A., Moore J.M. and Mellon M.T. (2001) Aqueous alteration of Mars-analog rocks under an acidic atmosphere (abs#2026). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)
- Bunch T.E. and Cohen A.J. (1968) Shock-induced structural disorder in plagioclase and quartz. In *Shock Metamorphism of Natural Materials* (eds. French and Short) 509-518. Mono Books Corp., Baltimore.  
Shergotty
- Bunch T.E. and Reid A.M. (1975) The nakhlites, I. Petrography and mineral chemistry. *Meteoritics* 10, 303-315.  
Lafayette Nakhla
- Bunch T.E., Irving A.J., Wittke J.H. and Kuehner S.M. (2005) NWA 2646: A Martian plagioclase-olivine clinopyroxenite akin to “Iherzolitic shergottites” (abs #5209). *Meteoritics & Planet. Sci.* 40, A25.  
NWA2646
- Bunch T.E., Irving A.J., Wittke J.H. and Kuehner S.M. (2008) Highly evolved basaltic shergottite Northwest Africa 2800: A clone of Los Angeles (abs#1953). *Lunar Planet. Sci.* XXXIX, Lunar Planetary Institute, Houston. (CD-ROM)  
NWA2800
- Bunch T.E., Irving A.J., Wittke J.H., Rumble D., Korotev R.L., Gellissen M. and Palme H. (2009) Petrology and composition of Northwest Africa 2990: A new type of fine-grained enriched, olivine-phyric shergottite (abs#2274). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.  
NWA2290

Burghel A., Dreibus G., Palme H., Rammensee W., Spettel B., Weckwerth G. and Wänke H. (1983) Chemistry of shergottites and the shergottite parent body (SPB): Further evidence for the two component model for planet formation (abs). *Lunar Planet. Sci.* XIV, 80-81. Lunar Planetary Institute, Houston.

Shergotty Zagami EETA79001 ALHA77005 Chassigny

Burger M., Eugster O. and Krähenbühl U. (1989) Refractory trace elements in different classes of achondrites by RNAA and INAA and some noble gas data (abs). *Meteoritics* 24, 256-257. Zagami

Burgess K.D., Musselwhite D.S. and Treiman A.H. (2006) Experimental petrology of olivine-phyric shergottite NWA1068: Toward defining a parental melt (abs#1972). *Lunar Planet. Sci.* XXXVII Lunar Planetary Institute, Houston. (CD-ROM)  
NWA1068

Burgess R., Wright I.P. and Pillinger C.T. (1987) The distribution of sulphur in Nakhla and shergottite meteorites (abs). *Meteoritics* 22, 344-345.  
Nakhla

Burgess R., Wright I.P. and Pillinger C.T. (1989) Distribution of sulphides and oxidized sulphur components in SNC meteorites. *Earth Planet. Sci. Lett.* 93, 314-320.  
Shergotty Nakhla Chassigny ALHA77005

Burns R.G. (1989) Olivine alteration phases in shergottite ALHA77005: Information from 4.2°K Mössbauer spectra (abs). *Lunar Planet. Sci.* XX, 129-130. Lunar Planet. Institute, Houston.  
ALHA77005

Burns R.G. (1991) Does Lafayette = Nakhla? Not necessarily so, based on 4.2°K Mössbauer spectra of all of the SNC meteorites (abs). *Lunar Planet. Sci.* XXII, 157-158. Lunar Planet. Institute, Houston.  
Lafayette Nakhla

Burns R.G. and Solberg T.C. (1988) Mössbauer spectra of weathered stony meteorites relevant to oxidation on Mars: II. Achondrites and SNC meteorites (abs). *Lunar Planet. Sci.* XIX, 146-147.  
Lunar Planet. Institute, Houston.  
Nakhla ALHA77005 EETA79001

Burns R.G. and Martinez S.L. (1990) Mössbauer spectra of olivine-rich achondrites: II Brachina, Chassigny, ALHA77005, and Nakhla (abs). *Lunar Planet. Sci.* XXI, 147-148. Lunar Planet. Institute, Houston.  
Chassigny ALHA77005 Nakhla

Burns R.G. and Martinez S.L. (1991) Mössbauer spectra of olivine-rich achondrites: Evidence for preterrestrial redox reactions. *Proc. Lunar Planet. Sci. Conf.* 21st, 331-340. Lunar Planetary Institute, Houston.  
Nakhla Lafayette Chassigny ALHA77005 EETA79001 Shergotty

Burragato F., Cavarretta G. and Funiciello R. (1975) The new Brazillian achondrite of Governador Valadaras (Minas Gerais). *Meteoritics* 10, 374-375.  
Governador Valadaras

Buseck Peter and seven authors (2001a) Is magnetite from Martian meteorite ALH84001 truly identical to that from bacteria? A TEM reexamination of the evidence (abs). *Meteoritics & Planet. Sci.* 36, A33.  
ALH84001

Buseck and seven authors (2001b) Magnetite morphology and life on Mars. *Proc. Nat. Acad. Science, USA* 98, 13490-13495.  
ALH84001

Buseck P.R., Weyland M., Midgley P.A., Dunin-Borkowski R.E. and Frankel R.B. (2003) Are current TEM techniques adequate to resolve the ALH84001 life-on-Mars controversy? (abs) *Lunar Planet. Sci. XXXIV*, #2044. Lunar Planetary Institute, Houston  
ALH84001

Busemann H. and Eugster O. (2002) The trapped heavy noble gases in recently found Martian meteorites (abs#1823). *Lunar Planet. Sci. XXXIII*. Lunar Planetary Institute, Houston. (CD-ROM)  
Los Angeles SaU005 Nakhla

Cady S.L., Walter M.R., Des Marais J. and Blank C.E. (1997) Exopaleontological search strategy for Mars Exploration: A case for siliceous epithermal deposits (abs). *Lunar Planet. Sci. XXVIII*, 197-198.  
Lunar Planet. Institute, Houston.  
ALH84001

Cahill J.T., Taylor L.A., Patchen A., Nazarov M.A., Stockstill K.R. and Anand M. (2002) Basaltic shergottite Dhofar 019: A “Normal” olivine cumulate product (abs#1722). *Lunar Planet. Sci. XXXIII* Lunar Planet. Institute, Houston. (CD-ROM)  
Dho019

Calvin C. and Rutherford M. (2005) ALH77005: The magmatic history from rehomogenized melt inclusions (abs#1894). *Lunar Planet. Sci. XXXVI* CD-ROM, Lunar Planet. Institute, Houston.

Calvin C., Rutherford M. and Sullivan N. (2006) Comparing primitive EETA79001 melts with those from other SNC meteorites (abs#1697). *Lunar Planet. Sci. XXXVII* Lunar Planet. Institute, Houston.  
EETA79001

Carlson R.W. and Irving A.J. (2004) Pb-Hf-Sr-Nd isotopic systematics and age of nakhelite NWA998 (abs#1442). *Lunar Planet. Sci. XXXV* Lunar Planet. Institute, Houston.  
NWA998

Carr M.H. (1990) D/H on Mars: Effects of floods, volcanism, impacts, and polar processes. *Icarus* 87, 210-227.

Carr M.H. (1996) *Water on Mars*. Oxford Univ. Press, NY. 229 pages

Carr M.H. and Garvin J. (2001) Mars exploration. *Nature* 412, 250-253.

Carr R.H. and Pillinger C.T. (1984) Carbon isotopic data for some SNC meteorites (abs). *Lunar Planet. Sci. XV*, 135-136. Lunar Planetary Institute, Houston.  
Chassigny Shergotty EETA79001

Carr R.H., Wright I.P. and Pillinger C.T. (1984) Martian atmospheric CO<sub>2</sub> in an Antarctic meteorite? *Meteoritics* 19, 204-205.

Carr R.H., Wright I.P. and Pillinger C.T. (1985a) Carbon isotopic analysis of the Shergotty meteorite (abs). *Lunar Planet. Sci. XVI*, Suppl. A, 5-6. Lunar Planetary Institute, Houston.  
Shergotty

Carr R.H., Wright I.P. and Pillinger C.T. (1985b) Carbon isotopes in three SNC meteorites. *Proc. Lunar Planet. Sci. Conf.* 15th; *J. Geophys. Res.* 90 (suppl.), C664-C668.  
Chassigny Shergotty EETA79001

Carr R.H., Grady M.M., Wright I.P. and Pillinger C.T. (1985c) Martian atmospheric carbon dioxide and weathering products in SNC meteorites. *Nature* 314, 248-250.  
Nakhla EETA79001

Carr R.H. and Gibson E.K. (1987) A laser microprobe - mass spectrometric study of an alteration product in the shergottite EETA79001 (abs). *Lunar Planet. Sci.* XVIII, 157-158. Lunar Planetary Institute, Houston.  
EETA79001

Cartwright J.A., Burgess R., Crowther S.A. and Gilmour J.D. (2008) Xenon isotope composition of shergottite RBT 04262 shergottites (abs#2000). *Lunar Planet. Sci.* XXXIX. Lunar Planet. Inst. Houston  
RBT04262

Cartwright J.A., Burgess R. and Gilmour J.D (2009) Xenon isotopes in shergottites RBT 04262, DAG 489, Shergotty and EET 79001 (abs#1907). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.  
RBT04262 DAG489 Shergotty EETA79001

Cartwright J.A., Burgess R. and Gilmour J.D (2009) Halogens in martian shergottite RBT 04262 (abs#1686). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.  
RBT 04262

Carver E.A. and Anders E. (1976) Fission track ages of four meteorites. *Geochim Cosmochim Acta* 40, 467-477.  
Nakhla

Cassidy W.A., Olsen E. and Yanai K. (1977) Antarctica: A deep-freeze storehouse for meteorites. *Science* 198, 727-731.

Cassidy W.A. and Rancitelli L. (1982) Antarctic meteorites. *Amer. Scientist.* 70, 156-164. (*review paper*)

Cassidy W.A., Harvey R.P., Schutt J., Delisle G. and Yanai K. (1992) The meteorite collection sites of Antarctica. *Meteoritics* 27, 490-525.

Chaklader J., Shearer C.K. and Horz F. (2005) Li, B – Behavior in lunar basalts during shock & thermal metamorphism: Implications for H<sub>2</sub>O in Martian magmas (abs#1426). *Lunar Planet. Sci.* XXXVI CD-ROM, Luny Planet Institute, Houston.

Chaklader J. and Shearer C.K. (2005) Effects of changing pyroxene composition on Li & B behavior in lunar basalts: Implications for Martian magmas (abs# 5253). *Meteoritics & Planet. Sci.* 40, A28.

Chamberlin T.C. (1897) The method of multiple working hypotheses. *J. Geol.* 5, 837-848.

Chang S-B. R. and Kirschvink J.L. (1989) Magnetofossils, the magnetization of sediments, and the evolution of magnetite biominalization. *Annual Rev. Earth Planet. Sci.* 17, 169-195.

Channon M.B., Bontifacie M., Stolper E.M. and Eiler J.M. (2009) Oxygen isotope compositions of mineral separates from SNC meteorites: Constraints on the petrogenesis of Martian magmas (abs#2450). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.  
ALHA77005 NWA1950 Lafayette NWA998

Chapman C.R. (1996) Bombarding Mars lately. *Nature* 380, 23. (*editorial*)

- Chatzitheodoridis E. (1990) A search for Martian alteration products and atmospheric argon in Nakhla meteorite. MS Thesis, Manchester University, Manchester.  
Nakhla
- Chatzitheodoridis E. and Turner G. (1990) Secondary minerals in the Nakhla meteorite (abs). *Meteoritics* 25, 354.  
Nakhla
- Chaussidon M. and Robert F. (1999)  $^7\text{Li}/^6\text{Li}$  and  $^{11}\text{B}/^{10}\text{B}$  ratios of SNC meteorites (abs#1592). *Lunar Planet. Sci. XXX* (CD-ROM) Lunar Planetary Institute, Houston.  
Shergotty Zagami EETA79001 Chassigny ALH84001
- Chen J.H. and Wasserburg G.J. (1985a) Peculiar U-Th-Pb systematics in Shergotty: A Martian lead? (abs) *Lunar Planet. Sci. XVI*, Suppl. A, 7-8. Lunar Planetary Institute, Houston.  
Shergotty
- Chen J.H. and Wasserburg G.J. (1985b) U-Th-Pb systematics in shergottites: Young ages and low mu (abs). *Meteoritics* 20, 623-624.  
Shergotty Zagami EETA79001
- Chen J.H. and Wasserburg G.J. (1986a) Formation ages and evolution of Shergotty and its parent planet from U-Th-Pb systematics. *Geochim. Cosmochim. Acta* 50, 955-968.  
Shergotty Zagami EETA79001
- Chen J.H. and Wasserburg G.J. (1986b) S ≠ N =? C. (abs) *Lunar Planet. Sci. XVII*, 113-114. Lunar Planetary Institute, Houston.  
Nakhla ALHA77005
- Chen J.H. and Wasserburg G.J. (1993) LEW88516 and SNC meteorites (abs). *Lunar Planet. Sci. XXIV*, 275-276. Lunar Planet. Institute, Houston.  
LEW88516
- Chen M. and El Goresy A. (1999) The nature of “maskelynite” in shocked meteorites: Not diaplectic glass but a glass-quenched from shock-induced dense melt at high pressure (abs). *Meteoritics & Planet. Sci.* 34, A24.
- Chen M. and El Goresy A. (2000) The nature of maskelynite in shocked meteorites: not a diaplectic glass but a glass quenched from shock-induced dense melt at high pressures. *Earth Planet. Sci. Lett.* 179, 489-502.
- Chen M., El Goresy A., Reynard B. and Gillet P. (2001) A comparative Raman spectroscopic study of maskelynite in SNC meteoites and diaplectic glass from the Ries crater: Implications to their origin (abs). *NIPR Sym. Antarctic Meteorites* 24th, 10-12. Nat. Inst. Polar Res., Tokyo.  
Zagami DaG476
- Chennaoui H., Jambon A., Reynard B. and Blanc P. (2002) High pressure silica phases in shergottites: A cathodoluminescence spectroscopic study (abs). *Meteoritics & Planet. Sci.* 37, A32.  
Zagami Los Angeles Shergotty NWA856 NWA480
- Chennaoui Aoudjehane H., Jambon A., Reynard B. and Blanc P. (2005) Silica as a shock index in shergottites: A catholuminescence study. *Meteoritics & Planet. Sci.* 40, 1-14.  
NWA480 NWA856 Zagami Shergotty Los Angeles
- Chennaoui Aoudjehane H., Jambon A. and Boudouma O. (2006) Cristobalite and K-feldspar in the nakhlite MIL03346: A cathodoluminescence study (abs#1037). *Lunar Planet. Sci. XXXVII* Lunar

Planet. Institute, Houston.  
MIL03346

Chennaoui Aoudjehane H. and Jambon A. (2006) Occurance of post stishovite in shergottites NWA856 and Zagami: A catholuminescence study (abs#1036). *Lunar Planet. Sci.* XXXVII Lunar Planet. Institute, Houston.  
NWA856 Zagami

Chevier V. and Lorand J.P. (2005) Sulfide mineralogy, redox conditions and alteration effects in some SNC meteorites (abs#2067). *Lunar Planet. Sci.* XXXVI CD-ROM, Lunar Planet. Institute, Houston.

Chikami J., Takeda H., Yugami K., Mikouchi T. and Miyamoto M. (1997) Zn behavior in chromite and daubreelite in some achondrites (abs). *NIPR Sym. Antarctic Meteorites* 22nd, 15-17. Nat. Inst. Polar Res., Tokyo.  
Zagami

Choleva N., Madsen M.B., Morup S., Lundgreen B., Jacobsen C.T. and Knudsen J.M. (1988) Mössbauer spectroscopy and SNC-meteorites. Rocks from the planet Mars? *Proc. Third Seeheim workshop on Mössbauer spectroscopy*, 509-510.

Christen F., Busemann H., Lorenzetti S. and Eugster O. (2004) Mars-ejection ages of Y000593, Y000749 and Y000802 (paired nakhlites) and Y980459 shergottite (abs). *Antarct. Met.* XXVIII, Nat. Inst. Polar Res., Tokyo.  
Y000593 Y980459

Christen F., Eugster Otto and Busemann H. (2005) Mars ejection times and neutron capture effects of the nakhlites Y000593 and Y000749, the olivine-phyric shergottite Y980459 and lherzolite NWA1950. *Antarct. Meteorite Res.* 18, 117-132. Nat. Inst. Polar Res., Tokyo.  
Y980459 NWA1950

Christensen P.R. and 21 authors (2003) Morphology and composition of the surface of Mars: Mars Odyssey THEMIS results. *Science* 300, 2056-2061.

Cisowski S.M. (1981) Magnetic properties of Shergotty and Zagami meteorites (abs). *Lunar Planet. Sci.* XII, 147. Lunar Planetary Institute, Houston.  
Shergotty Zagami

Cisowski S.M. (1982) Magnetic properties and remanence of Antarctic shergottite EETA79001 (abs). *Lunar Planet. Sci.* XIII, 106. Lunar Planetary Institute, Houston.  
EETA79001

Cisowski S.M. (1985) Magnetism of the shergottite meteorites (abs). *Lunar Planet. Sci.* XVI, Suppl. A, 9-10. Lunar Planetary Institute, Houston  
Shergotty Zagami ALHA77005 EETA79001

Cisowski S.M. (1986) Magnetic studies on Shergotty and other SNC meteorites. *Geochim. Cosmochim. Acta* 50, 1043-1048.  
Shergotty Zagami ALHA77005 EETA79001 Nakhla Governador Valadares

Cisowski S.M. (1987) Magnetism of meteorites. In *Geomagnetism 2* (ed. Jacobs) pp 525-560. Academic Press, London.

Clark R.S., Rowe M.W., Ganapathy R. and Kuroda P.K. (1967) Iodine, uranium and tellurium contents of meteorites. *Geochim. Cosmochim. Acta* 31, 1605-1613.  
Nakhla Lafayette

- Clark B.C., Baird A.K., Weldon R.J., Tsusaki D.M., Schnabel L. and Candelaria P. (1982) Chemical composition of Martian Fines. *J. Geophys. Res.* 87, 10,059-10,067.
- Clark B.C. (1983) Correspondance of shergottites and Martian fines (abs). *Lunar Planet. Sci. XIV*, 117-118. Lunar Planet. Institute, Houston.
- Clark B.C. (1993) Geochemical components in Martian soil. *Geochim. Cosmochim. Acta* 57, 4575-4581.
- Clark B.C. (2003) Sterilized sample return: Breaking through the Mars science barriers (abs#1797). *Lunar Planet. Sci. Conf. 34<sup>th</sup>* Lunar Planetary Institute, Houston (CD-ROM).
- Clayton R.N. (1993a) Oxygen isotopes in meteorites. *Ann. Rev. Earth Planet. Sci.* 21, 115-149. (*review paper*)
- Clayton R.N. (1993b) Oxygen isotope analysis of ALH84001. In *Antarctic Meteorite Newsletter* 16 (3), 4. JSC Curator's Office, Houston. (*see address in Appendix III*)  
ALH84001
- Clayton R.N., Onuma N. and Mayeda T.K. (1976) A classification of meteorites based on oxygen isotopes. *Earth Planet. Sci. Lett.* 30, 10-18.  
Lafayette, Shergotty
- Clayton R.N. and Mayeda T.K. (1982) Oxygen isotopes in carbonaceous chondrites and in achondrites (abs). *Lunar Planet. Sci. XIII*, 117-118. Lunar Planet. Institute, Houston.  
Shergotty Zagami Nakhla Lafayette Chassigny EETA79001
- Clayton R.N. and Mayeda T.K. (1983) Oxygen isotopes in eucrites, shergottites, nakhlites, and chassignites. *Earth Planet. Sci. Lett.* 62, 1-6.  
Shergotty Zagami EETA79001 Nakhla Lafayette Chassigny
- Clayton R.N. and Mayeda T.K. (1985) Oxygen isotopes in Shergotty (abs). *Lunar Planet. Sci. XVI*, Suppl. A, 11-12. Lunar Planetary Institute, Houston.  
Shergotty
- Clayton R.N. and Mayeda T.K. (1986) Oxygen isotopes in Shergotty. *Geochim. Cosmochim. Acta* 50, 979-982.  
Shergotty
- Clayton R.N. and Mayeda T.K. (1988) Isotopic composition of carbonate in EETA79001 and its relation to parent body volatiles. *Geochim. Cosmochim. Acta* 52, 925-927.  
EETA79001
- Clayton R.N. and Mayeda T.K. (1992) Oxygen isotopic compositions of achondrites. *NIPR Sym. Antarctic Meteorites* 17th, 160-163. Nat. Inst. Polar Res., Tokyo. (*review paper*)
- Clayton R.N. and Mayeda T.K. (1996) Oxygen isotopic studies of achondrites. *Geochim. Cosmochim. Acta* 60, 1999-2017.  
ALHA77005 ALH84001 Chassigny EETA79001 Lafayette LEW88516 QUE94201 Shergotty Y793605 Zagami
- Cleland C.E. and Chyba C.F. (2002) Defining 'Life'. *Origins of Life and Evolution of the Biosphere* 32: 387-393.
- Clemett S.J. and Zare R.N. (1996) Evaluating the evidence for past life on Mars: Response. *Science* 274,

2122-2123.

ALH84001

Clemett S.J., Dulay M.T., Gillette J.S., Chiller X.D.F., Mahajan T.B. and Zare R.N. (1998a) Evidence for the extraterrestrial origin of polycyclic aromatic hydrocarbons (PAHs) in the Martian meteorite ALH84001. *Faraday Discuss. R. Soc. Chem.* 109, 417-436, London.  
ALH84001

Clemett S.J., Dulay M.T., Gillette J.S., Chiller X.D.F., Mahajan T.B. and Zare R.N. (1998b) Are the polycyclic aromatic hydrocarbons in ALH84001 of extraterrestrial origin?: A reevaluation (abs#1812). *Lunar Planet. Sci. XXIX* Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Clemett S.J. and 11authors (2002) Crystal morphology of MV-1 magnetite. *Amer. Mineral.* 87, 1727-1730.

Collinson D.W. (1985) Magnetic properties of Antarctic shergottites EETA79001 and ALHA77005 (abs). *Meteoritics* 20, 628.  
EETA79001 ALHA77005

Collinson D.W. (1986) Magnetic properties of Antarctic shergottite meteorites EETA79001 and ALHA77005: Possible relevance to a Martian magnetic field. *Earth Planet. Sci. Lett.* 77, 159-164.  
EETA79001 ALHA77005

Collinson D.W. (1992) The magnetism of SNC meteorites-Was there an ancient magnetic field on Mars? (abs) *Meteoritics* 27, 211.

Collinson D.W. (1997) Magnetic properties of Martian meteorites: Implications for an ancient Martian magnetic field. *Meteoritics & Planet. Sci.* 32, 803-811.  
ALH84001 Zagami EETA79001 Nakhla Lafayette Governador Valadares Chassigny

Colson R.O., Nyquist L., McKay G. amd Hörz F. (1987) Possible isotopic resetting mechanisms in shergottite meteorites (abs). *Lunar Planet. Sci. XVIII*, 191-192. Lunar Planetary Institute, Houston.

COMPLEX – see Wood *et al.* 2003.

Connolly H.C. and 9 authors (2007) The Meteoritical Bulletin, No. 91, 2007 March. *Meteoritics & Planet. Sci.* 42, 413-466.  
NWA2969 NWA4468

Connolly H.C. and 7 authors (2007) The Meteoritical Bulletin, No. 92, 2007 September. *Meteoritics & Planet. Sci.* 42, 1647-1694.  
RBT04261 NWA4480 NWA4527.

Connolly H.C. and 7 authors (2008) The Meteoritical Bulletin, No. 93, 2008 March. *Meteoritics & Planet. Sci.* 43, 571-637.  
NWA2800 NWA4797 NWA5029

Cooney T.F., Scott E.R.D., Krot A.N., Sharma S.K. and Yamaguchi A. (1998) Confocal raman microprobe and IR reflectance study of minerals in the Martian Meteorite ALH84001 (abs#1332). *Lunar Planet. Sci. XXIX* Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Cooney T.F., Scott E.R.D., Krot A.N., Sharma S.K. and Yamaguchi A. (1999) Vibrational spectroscopic study of minerals in the Martian meteorite ALH84001. *Amer. Mineral.* 84, 1569-1576.

ALH84001

Corrigan C.M., Harvey R.P. and Bradley J. (1999) Sodium-bearing pyroxene phase in ALH84001 (abs). P-62, GSA, Denver.  
ALH84001

Corrigan C.M., Harvey R.P. and Bradley J. (2000) Sodium-bearing pyroxene in ALH 84001 (*abs#1762*). *Lunar Planet. Sci.* XXXI (CD-ROM). Lunar Planetary Institute, Houston.  
ALH84001

Corrigan C.M., Harvey R.P. and Bradley J. (2001) Phyllosilicate minerals in Martian meteorite ALH84001 (*abs*). *Clay Mineralogy*  
ALH84001

Corrigan C.M. and Harvey R.P. (2002) Unique carbonates in Martian meteorite Allan Hills 84001 (*abs#1051*). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)  
ALH84001

Corrigan C.M. and Harvey R.P. (2003) Evidence for a second generation of magnesite in Martian meteorite Allan Hills 84001 (*abs#1255*). *Lunar Planet. Sci.* XXXIV Lunar Planetary Institute, Houston  
ALH84001

Corrigan C.M., Vicenzi E.P., Harvey R.P. and McCoy T.J. (2003a) Chemical imaging of carbonates in Martian meteorites ALH84001 using time of flight secondary ion mass spectrometry (*abs*). *Meteoritics & Planet. Sci.* 38, A141.  
ALH84001

Corrigan C.M., Niles P.B., Leshin L.A., Harvey R.P., Guan Y. and McKeegan K.D. (2003b) Oxygen isotopic compositions of unique carbonates in Martian meteorites Allan Hills 84001 (*abs*). *Meteoritics & Planet. Sci.* 38, A139.  
ALH84001

Corrigan C.M. and Harvey R.P. (2004) Multi-generational carbonate assemblages in Martian meteorite Allan Hills 84001: Implications for nucleation, growth and alteration. *Meteoritics & Planet Sci.* 39, 17-30.  
ALH84001

Corrigan C.M., Vicenzi E.P., Steele A.S., Amundsen H.E.F., McCoy T.J. and Treiman A.H. (2004) Slab carbonates in Allan Hills 84001 and in basalts from Spitzbergen, Norway: Further examination of terrestrial analogies (*abs*). *Meteoritics & Planet. Sci.* 39, A25.  
ALH84001

Costley W.C. (1865) Circumstances of Shergotty meteorite fall. *Proc. Asiatic Soc. Bengal*, p194  
Shergotty

Coulson A.L. (1940) *A catalogue of meteorites: with special reference to Indian falls and finds and to specimens in the Indian Museum, Calcutta.* Geol. Survey India, Mem. vol. 75. Calcutta.  
Shergotty

Cristen F., Eugster O. and Busemann H. (2005) Mars ejection times and neutron capture events of the nakhlites Y000593 and Y000749, the olivine-phyric shergottite Y980459, and the lherzolite NWA1950. *Antarctic Meteorite Res.* 18, --- Nat. Inst. Polar Res., Tokyo.

Crozaz G. (1979) Uranium and thorium microdistributions in stony meteorites. *Geochim. Cosmochim.*

*Acta* 43, 127-136.

Nakhla Lafayette

Crozaz G. and Wadhwa M. (1999) Chemical alteration of hot desert meteorites: The case of shergottite Dar al Gani 476. In Workshop on Extraterrestrial Materials from Cold and Hot Deserts. LPI Cont. 997. (eds. Schultz *et al.*) Lunar Planetary Institute, Houston.  
DaG476

Crozaz G., Wadhwa M. and Barrat J.A. (2001) Trace elements in NWA480: Still more diversity in the basaltic Shergottite group (abs). *Meteoritics & Planet. Sci.* 36, A45.  
NWA480

Crozaz G. and Wadhwa M. (2001) The terrestrial alteration of Saharan Shergottites Dar al Gani 476 and 489: A case study of weathering in a hot desert environment. *Geochim. Cosmochim. Acta* 65, 971-978.  
DaG476 DaG489

Crozaz G., Floss C. and Wadhwa M. (2003) Chemical alteration and REE mobilization in meteorites from hot and cold deserts. *Geochim. Cosmochim. Acta* 67, 4727-4741.

Curtis D., Gladney E. and Jurney E. (1980) A revision of the meteorite-based, cosmic abundance of boron. *Geochim. Cosmochim. Acta* 44, 1945-1953.  
Nakhla Chassigny

Dalton J.B. and Bishop J.L. (2003) Micro-spectroscopy as a tool for detecting micron-scale mineral variations across a rock surface: An example using a thin section of Martian meteorite ALH84001 (abs#2066). *Lunar Planet. Sci. Conf.* XXXIV Lunar Planet. Institute, Houston (CD-ROM).  
ALH84001

Dalton H.A., Musselwhite D.S., Kiefer W. and Treiman A.H. (2005) Experimental petrology of the basaltic shergottite Yamato 980459: Implications for the thermal structure of the Martian mantle (abs#2142). *Lunar Planet. Sci. XXXVI* CD-ROM Lunar Planet. Institute, Houston.  
Y980459

Dalton H.A., Peslier A.H., Brandon A.D., Lee C-T.A. and Lapan T.J. (2008) Petrology and mineral chemistry of new olivine-phyric shergottite RBT04262 (abs#2308). *Lunar Planet. Sci. XXXIX.* Lunar Planet. Inst. Houston  
RBT04262

Damour A. (1862) Note sur la pierre meteoritique de Chassigny. *Compt. Rend. Acad. Sci. Paris* 55, 591-594.  
Chassigny

Dann J.C., Holzheid A.H., Grove T.L. and McSween H.Y. (2000) Phase equilibria of the Shergotty meteorite: New petrologic constraints on the H<sub>2</sub>O contents of Martain magmas (abs#1081). *Lunar Planet. Sci. XXXI,* (CD-ROM). Lunar Planetary Institute, Houston.  
Shergotty

Dann J.C., Holzheid A.H., Grove T.L. and McSween H.Y. (2001) Phase equilibria of the Shergotty meteorite: constraints on pre-eruptive water contents of Martian magmas and fractional crystallization under hydrous conditions. *Meteoritics & Planet. Sci.* 36, 793-806.  
Shergotty

Dasch P. and Kross J. (1996) My favorite Martians: NASA uncovers evidence of ancient life on Mars. *Ad Astra* 8-5, 27-29.

Dasch P. and Treiman A. (1997) *Ancient life on Mars???* A Slide Set. Lunar Planetary Institute, Houston.

Day J.M.D., Taylor L.A., Floss C., McSween H.Y., Liu Y. and Hill E. (2005) Petrogenesis of Martian nakhelite MIL 03346 (abs#5288). *Meteoritics & Planet. Sci.* 40, A36.  
MIL03346

Day J.M.D., Taylor L.A., Floss C. and McSween H.Y. (2006) Petrology and chemistry of MIL 03346 and its significance in understanding the petrogenesis of nakhellites on Mars. *Meteoritics & Planet. Sci.* 40, 581-606.  
MIL03346

Debraille V., Yin Q.Z., Brandon A.D., Jacobsen B. and Treiman A.H. (2007) Lu-Hf and Sm-Nd isotopic studies of shergottites and nakhellites: Implications for Martian mantle sources (abs#1903). *Lunar Planet. Sci.* XXXVIII Lunar Plant. Inst. Houston (CD-ROM)  
Zagami Shergoty NWA856 Los Angeles Nakhla MIL03346 Y000593

de Duve C.R. (1995) Vital Dust. Basic Books, NY.

Delano J.W. and Arculus R.J. (1980) Nakhla: oxidation state and other constraints (abs). *Lunar Planet. Sci.* XI, 219-221. Lunar Planetary Institute, Houston.  
Nakhla

Delaney J.S. (1992) Petrological comparison of LEW88516 and ALHA77005 shergottites (abs).  
*Meteoritics* 27, 213-214.  
LEW88516 ALHA77005

Delaney J.S. (1994) A model composition for Mars derived from the oxygen isotopic ratios of Martian/SNC meteorites (abs). *Meteoritics* 29, 459.

Delaney J.S., Sutton S. R. and Dyar D.M. (1998) Variable oxidation states of iron in Martian meteorites (abs#1241). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
Shergotty Zagami Nakhla ALHA77005 EETA79001 LEW88516

Delaney J.S., Dyar D.M., Sutton S. R., Polyak D. and Stefanis M. (1999) Mineralogical  $\text{Fe}^{+3}/\text{Fe}$  measurements as proxies of volatile budgets: III Oxidation state zoning in Martian basalt (abs#1861). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM).

Delaney J.S. and Dyar M.D. (2000) Correction of the calibration of ferric/ferrous determinations in pyroxene from Martain samples and achondritic meteorites by synchrotron microXANES spectroscopy. (abs). *Lunar Planet. Sci.* XXXI, (CD-ROM). Lunar Planetary Institute, Houston.  
Shergotty Zagami Nakhla Chassigny ALH77005 EETA79001 LEW88516 ALH84001

Delaney J.S. and Dyar M.D. (2001) Magmatic magnetite in Martian meteorite melt inclusions from Chassigny (abs). *Meteoritics & Planet. Sci.* 36, A48.  
Chassigny

Delaney J.S. and Dyar M.D. (2002a) Compositional and oxidation state zoning in Martian pyroxene: Paradox or process indicator (abs#1659). *Lunar Planet. Sci.* XXXIII. Lunar Planetary Institute, Houston. (CD-ROM)  
QUE94201

Delaney J.S. and Dyar M.D. (2002b) What should we (be) looking for in Martian meteorites? Is evidence of crustal process or mantle process more important...and to whom? (abs) Un-mixing SNCs. 11-12. LPI Contribution No. 1134.

Delaney J.S. and Dyar M.D. (2003) Comparison of synchrotron microXANES determination of Fe<sup>3+</sup>/Z<sub>Fe</sub> with Mossbauer values for clean mineral separates of pyroxenes from Martian meteorites (abs#1979). *Lunar Planet. Sci.* XXXIV Lunar Planetary Institute, Houston

Deloule E. (2002) D/H ratio ion probe measurements on magmatic minerals from Martian meteorites: Implications for degassing of the Martian mantle (abs#1607). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)  
Nakhla Chassigny Zagami NWA480 NWA856

Dera P., Prewitt C.T., Boctor N.Z. and Hemley R.J. (2002) Characterization of a high-pressure phase of silica from the Martian meteorite Shergotty. *Amer. Mineral.* 87, 1018-1023.  
Shergotty

Devouard B., Posfal M., Hua X., Bazylinski D.A., Frankel R.B. and Buseck P.R. (1998) Magnetite from magnetotactic bacteria: Size distributions and twinning. *Amer. Mineral.* 83, 1387-1398.  
ALH84001

Dodd R. T. (1981) *Meteorites: A petrologic-chemical synthesis.* Cambridge Univ. Press. pp368 (*good introduction to meteorites*)  
Nakhla Lafayette Governador Valadares Chassigny Shergotty Zagami ALHA77005

Domeneghetti M.C., Fioretti A.M., Camara F., Molin G. and Tazzoli V. (2006a) Closure temperature of Fe+2-Mg ordering in orthopyroxene: Implications for thermal history of ALH84001 meteorite (abs#1237). *Lunar Planet. Sci.* XXXVII Lunar Planetary Institute, Houston.  
ALH84001

Domeneghetti M.C., Fioretti A.M., Camara F., Molin G. and McCammon C. (2006b) Constraints on the thermal history and oxidation state of MIL03346 Martian meteorite: Single-crystal XRD, electron microprobe and Mossbauer analysis of clinopyroxene (abs#1238). *Lunar Planet. Sci.* XXXVII Lunar Planetary Institute, Houston.  
MIL03346

Domeneghetti M.Chiara., Fioretti Anna.M., Camara Fernando., Molin Gian. and Tazzoli Vitto. (2008) Thermal history of ALH84001 meteorite by Fe+2-Mg ordering in orthopyroxene. *Meteoritics & Planet. Sci.* 42, 1703-1710.  
ALH84001

Douglas C., Wright I.P., Yates P.D. and Pillinger C.T. (1992) The carbon isotopic composition of LEW88516, the fifth shergottite (abs). *Meteoritics* 27, 215-216.  
LEW88516

Douglas C., Wright I.P. and Pillinger C.T. (1994) A search for further concentrations of organic materials in EETA79001 (abs). *Lunar Planet. Sci.* XXV, 339-340. Lunar Planetary Institute, Houston.  
EETA79001

Dowty E. (1977) Phosphates in Agra Dos Reis: Structure and composition of Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> minerals. *Earth Planet. Sci. Lett.* 35, 347-351.

Drake M.J. (1982) Igneous rocks from asteroids (and Mars?). *Geotimes* 27, 27.

Drake M.J., Greeley R., McKay G.A., Blanchard D.P., Carr M.H., Gooding J., McKay C.P., Spudis P.D. and Squyres S.W. (1987) Workshop on Mars sample return science. *LPI Tech. Rpt.* 88-07, Lunar Planetary Institute, Houston.

Drake M.J., Newsom H.E. and Capobianco C.J. (1989) V, Cr, and Mn in the Earth, EPB and SPB and the origin of the Moon: Experimental studies. *Geochim. Cosmochim. Acta* 53, 2101-2111.

Drake M.J., Owen T., Swindle T.D. and Musselwhite D.S. (1993) Noble gas evidence of an aqueous reservoir near the surface of Mars more recently than 1.3 Ga (abs). *Lunar Planet. Sci. XXIV*, 431-432. Lunar Planetary Institute, Houston.

Drake M.J., Swindle T.D., Owen T. and Musselwhite D S. (1994) Fractionated Martian atmosphere in the nakhlites? *Meteoritics* 29, 854-859.

Draper D.S. (2009) Yamato 980459 liquid line of descent at 0.5 GPa: Approaching QUE94201 (abs#1907). *Lunar Planet. Sci. XL*, Lunar Planetary Institute, The Woodlands.

Draper D.S., Bogard D.D., Agee C.B., McKay G.A. and Jones J.H. (2002) Merits of a locality sample for accomplishing Mars exploration goals: The first sample return mission (abs). AGU

Dreibus G. (1999) On the early differentiation of Mars. *Ninth Annual V. M. Goldschmidt Conference*, 78, Cambridge

Dreibus G., Palme H., Rammensee W., Spettel B., Weckwerth G. and Wänke H. (1981) Chemistry of the Shergotty parent body (abs). *Meteoritics* 16, 310.  
Shergotty

Dreibus G. and Wänke H. (1982) Parent body of the SNC-meteorites: chemistry, size and formation (abs). *Meteoritics* 17, 207-208.

Dreibus G., Palme H., Rammensee W., Spettel B., Weckwerth G. and Wänke H. (1982) Composition of the Shergotty parent body: Further evidence of a two component model for planet formation (abs). *Lunar Planet. Sci. XIII*, 186-187. Lunar Planetary Institute, Houston.  
Shergotty

Dreibus G. and Wänke H. (1985) Mars, a volatile-rich planet. *Meteoritics* 20, 367-381.

Dreibus G., Wänke H. and Schultz L. (1985) Mysterious iodine-overabundance in Antarctic meteorites. In *International Workshop on Antarctic Meteorites*. (ed. Annexstad) *LPI Tech. Rpt.* 86-1, 34-36. Lunar Planetary Institute, Houston.  
Shergotty ALHA77005 EETA79001

Dreibus G. and Wänke H. (1987) Volatiles on Earth and Mars: A comparison. *Icarus* 71, 225-240.  
Shergotty Zagami Nakhla EETA79001 ALHA77005 Chassigny

Dreibus G. and Wänke H. (1990) Mars: Data from SNC-meteorites, Viking- and Phobos-missions (abs). *Meteoritics* 25, 359.

Dreibus G., Jochum K.H., Palme H., Spettel B., Wlotzka F. and Wänke H. (1992) LEW88516: A meteorite compositionally close to the "Martian mantle" (abs). *Meteoritics* 27, 216-217.  
LEW88516 ALHA77005

Dreibus G. and Wänke H. (1992) On the weathering of Martian igneous rocks (abs). In *MSATT workshop on chemical weathering on Mars*. (eds. Burns and Banin) *LPI Tech. Rpt.* 92-04, 11-12. Lunar Planetary Institute, Houston.

Dreibus G., Burghele A., Jochum K.P., Spettel B., Wlotzka F. and Wänke H. (1994) Chemical and mineral composition of ALH84001: A Martian orthopyroxenite (abs). *Meteoritics* 29, 461.  
ALH84001

Dreibus G., Jagoutz E., Spettel B. and Wänke H. (1996a) Phosphate-mobilization on Mars? Implication from leach experiments on SNC's (abs). *Lunar Planet. Sci.* XXVII, 323-324. Lunar Planetary Institute, Houston.  
Shergotty Zagami ALHA77005

Dreibus G., Spettel B., Wlotzka F., Schultz L., Weber H.W., Jochum K.P. and Wänke H. (1996b)  
QUE94201: An unusual Martian basalt (abs). *Meteoritics & Planet. Sci.* 31, A39-40.  
QUE94201

Dreibus G., Wänke H. and Lugmair G.W. (1997) Volatile inventories of Mars and Earth and their implications for the evolution of the planetary atmospheres (abs). In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life.* (eds. Clifford et al.) *LPI Contribution* 916, 26. Lunar Planetary Institute, Houston.  
Shergotty Zagami EETA79001 QUE94201 ALHA77005 LEW88516 Lafayette Nakhla  
Chassigny ALH84001

Dreibus G., Rieder R., Bruckner J. and Wänke H. (1998) Chemical composition of rocks and soil at the Pathfinder site and their relation to the Martian meteorites (abs). *Meteoritics & Planet. Sci.* 33, A42. Shark

Dreibus G., Spettel B., Huth J. and Zipfel J. (1999) Halogens in Nakhla: Terrestrial or Martian origin (abs). *Meteoritics & Planet. Sci.* 34, A33-34.  
Nakhla

Dreibus G., Spettel B., Haubold R., Jochum K. P., Palme H., Wolf D. and Zipfel J. (2000) Chemistry of a new shergottite: Sayh al Uhaymir 005 (abs). *Meteoritics & Planet. Sci.* 35, A49.  
SaU005

Dreibus G., Huisl W., Haubold R. and Jagoutz E. (2001) Influence of terrestrial desert weathering in Martian meteorites (abs). *Meteoritics & Planet. Sci.* 36, A50-51.

Dreibus G., Wlotzka F., Huisl W., Jagoutz E., Kubny A. and Spettel B. (2002) Chemistry and petrology of the most feldspathic shergottite: Dhofar 378 (abs). *Meteoritics & Planet. Sci.* 37, A43.  
Dho378

Dreibus G. and Jagoutz E. (2002a) Constraints on Martian evolution from SNC meteorites (abs). *Antarctic Meteorites* XXVII, 12-14, Nat. Inst. Polar Res., Tokyo.

Dreibus G. and Jagoutz E. (2002b) Crust-mantle reservoirs of radiogenic isotopes of Mars and earth: Where can we see a mixing? (abs) Un-mixing SNCs. 13-14. LPI Contribution No. 1134. Lunar Planetary Institute, Houston

Dreibus G. and Jagoutz E. (2003) Chemical and isotopic constraints for the Martian crust (abs#1350). *Lunar Planet. Sci.* XXXIV Lunar Planetary Institute, Houston

Dreibus G., Huisl W., Spettel B. and Haubold R. (2003a) Comparison of the chemistry of Y-000593 and Y-000749 with other nakhlites (abs#1586). *Lunar Planet. Sci.* XXXIV Lunar Planetary Institute, Houston  
Y000593 Y000749

Dreibus G., Haubold R., Huisl W. and Spettel B. (2003b) Comparison of the chemistry of Yamato 980459 with DaG 476 and SaU 005 (abs). International Symposium. *Evolution of Solar System: A New Perspective from Antarctic Meteorites*, 19-20. Nat. Inst. Polar Res., Tokyo.  
Y980459 DaG476 SaU005

Dreibus G., Huisl W., Spettel B. and Haubold R. (2006) Halogens in Nakhlites: Studies of pre-terrestrial and terrestrial weathering processes (abs#1180). *Lunar Planet. Sci. Conf. XXXVII* Lunar Planetary Institute, Houston  
Lafayette Nakhla Y000593 NWA998 MIL03346

Duke M.B. (1963) *Petrology of basaltic achondrites.* Ph. D. Dissertation, Calif. Inst. of Tech., Pasadena.  
Shergotty

Duke M.B. (1968) The Shergotty meteorite: Magmatic and shock metamorphic features. In *Shock Metamorphism of Natural Materials.* (ed. French and Short), 612-621. Mono Book Corp., Baltimore.  
Shergotty

Duke M.B. and Silver L.T. (1967) Petrology of eucrites, howardites and mesosideroites. *Geochim. Cosmochim. Acta* 31, 1637-1665.  
Shergotty

Dunlop D.J. and Arkani-Hamed J. (2005) Magnetic minerals in the Martian crust. *J. Geophys. Res.* 110, E12S04.

D'yakonova M.I. and Kharitonova V.Y. (1960) Chemical analyses of some stoney and iron meteorites from the collection of the Academy of Sciences of the USSR. *Meteoritika* 18, 48-67.  
Chassigny

Dyar M.D. (2002) Mössbauer spectroscopy of SNC meteorites (abs). Un-mixing SNCs. 15-16. LPI Contribution No. 1134. Lunar Planetary Institute, Houston

Dyar M.D. (2003a) Mössbauer spectroscopy of mineral separates from SNC meteorites (abs#1701).  
*Lunar Planet. Sci. XXXIV*, Lunar Planetary Institute, Houston  
ALHA77005 Chassigny EETA79001 Governadore Valadares Lafayette Nakhla Shergotty Zagami

Dyar M.D. (2003b) Ferric iron in SNC meteorites as determined by Mössbauer spectroscopy: Implications of the Martian landers and Martian oxygen fugacity. *Meteoritics & Planet. Sci.* 38, 1733-1752.

Dyar M.D. and Schaefer M.W. (2003c) Mössbauer spectroscopy on the Martian surface: Constraints of the interpretation of MER data (abs#1329). *Lunar Planet. Sci. XXXIV* Lunar Planetary Institute, Houston.

Dyar M.D., Pieters C.M., Hiroi T., Lane M.D. and Marchand G.J. (2005a) Integrated spectroscopic studies of MIL03346 (abs#1261). *Lunar Planet. Sci. XXXVI* CD-ROM, Lunar Planetary Institute, Houston.  
MIL03346

Dyar M. Darby, Treiman A.H., Pieters C.M., Hiroi T., Lane M.D. and O'Connor V. (2005b) MIL03346, the most oxidized Martain meteorite: A first look at spectroscopy, petrography, and mineral chemistry. *J. Geophys. Res.* 110, E09005 doi:  
MIL03346

Easton A.J. and Elliott C.J. (1977) Analysis of some meteorites from the British Museum (Natural History) collection. *Meteoritics* 12, 409-416.  
Zagami

Eberhardt P. and Hess D.C. (1960) Helium in stone meteorites. *Astrophys. J.* 131, 38-46.  
Shergotty

Ebihara M., Kong P. and Shinotsuka K. (1997a) Chemical composition of Y-793605, a Martian lherzolite (abs). *NIPR Sym. Antarctic Meteorites* 22nd, 22-26. Nat. Inst. Polar Res., Tokyo.  
Y793605

Ebihara M., Kong P. and Shinotsuka K. (1997b) Chemical composition of Y-793605, a Martian lherzolite. *Antarctic Meteorite Research* 10, 83-94. Nat. Inst. Polar Res., Tokyo.  
Y793605

Ebihara M., Shinotsuka K. and Kong P. (1998) Chemical composition of Martian meteorites (abs). *Meteoritics & Planet. Sci.* 33, A44.

Economou T.E., Turkevich A., Rieder R. and Wänke H. (1997) Report on the status of the APX on Mars Pathfinder mission (abs). *Lunar Planet. Sci.* XXVIII, 319-320. Lunar Planetary Institute, Houston (CD-ROM).  
Zagami

Economou T.E., Rieder R., Wänke H., Bruckner J., Dreibus G., Crisp J. and McSween H.Y. (1998) The chemical composition of Martian rocks and soils: Preliminary analysis (abs#1711). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).

Economou T.E., Foley C.N. and Clayton R.N. (2003) The chemical composition of Martian samples – final results from the Pathfinder alpha proton X-ray spectrometer (abs). *Sixth International Conf. on Mars.* #3155

Edmunson J., Borg, L.E., Shearer C., Papike J.J. and Davidson K. (2001) High-Si glasses in basaltic Shergottite DaG 476 and their implications for geochronology (abs). *Lunar Planet. Sci.* XXXII, #1439. Lunar Planetary Institute, Houston. (CD-ROM)  
DAG476

Edmunson J., Borg L.E., Schearer C.K. and Papike J.J. (2002) Olivines in Iherzolitic shergottite ALH77005: Inclusions and geochronology (abs#1844). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)  
ALH77005

Edmunson J., Borg L.E., Shearer C.K. and Papike J.J. (2005) Defining the mechanisms that disturb the Sm-Nd isotopic systematics of the Martian meteorites: Examples from Dar al Gani and Allan Hills 77005. *Meteoritics & Planet. Sci.* 40, 1159-1174.  
ALH77005

Edwards H.G.M., Farwell D.W., Grady M.M., Wynn-Williams D.D., Wright I.P. (1999) Comparative Raman spectroscopy of a Martian meteorite and Antarctic lithic analogs. *Planet. Space Sci.* 47, 353-362.

Ehmann W.D. and Lovering J.F. (1967) The abundance of mercury in meteorites and rocks by neutron activation analysis. *Geochim. Cosmochim. Acta* 31, 357-376.  
Nakhla

Eichhorn G., Accomazzi A., Grant C.S., Kurtz M.J. and Murray S.S. (1998) Planetary literature in the ABS abstract service (abs#1514). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).

Eiler J.M., Valley J.W. and Graham C.M. (1997a) Standardization of SIMS analysis of O and C isotope ratios in carbonate from ALH84001 (abs). *Lunar Planet. Sci.* XXVIII, 327-328. Lunar Planetary Institute, Houston  
ALH84001

- Eiler J.M., Valley J.W. and Stolper E.M. (1997b) Stable isotopes in Allan Hills 84001: An ion microprobe study (abs). *Meteoritics & Planet. Sci.* 32, A38.  
ALH84001
- Eiler J.M., Valley J.W., Graham C.M. and Fournelle J. (1998) Geochemistry of carbonates and glass in ALH84001 (abs). *Meteoritics & Planet. Sci.* 33, A44-45.  
ALH84001
- Eiler J., Kitchen N. and Leshin L. (2001) The hosts of hydrogen in ALH84001: evidence for hydrous Martian salts in the oldest SNC meteorite (abs). *Eleventh Goldschmidt Conf.* 3376. Hot Springs.  
ALH84001
- Eiler J., Valley J.W., Graham C.M. and Fournelle J. (2002a) Two populations of carbonate in ALH84001: Geochemical evidence for discrimination and genesis. *Geochim. Cosmochim. Acta* 66, 1285-1303.  
ALH84001
- Eiler J., Kitchen N., Leshin L. and Strausberg M. (2002b) Hosts of hydrogen in Allan Hills 84001: Evidence for hydrous martian salts in the oldest martain meteorite. *Meteoritics & Planet. Sci.* 37, 395-405.  
ALH84001
- Elardo S., Harrington A., Nekvasil H., McCubbin F.M. and Lindsley D.H. (2008) Constraints on water contents of martian magmas: Inferences from the Chassigny meteorite and experiments on Backstay (abs#1802). *Lunar Planet. Sci.* XXXIX Lunar Planetary Institute, Houston (CD-ROM).  
Chassigny Backstay
- El Goresy A., Wopenka B., Chen M. and Kurat G. (1997a) The saga of maskelynite in Shergotty (abs). *Meteoritics & Planet. Sci.* 32, A38-39.  
Shergotty
- El Goresy A., Chen M., Sharp T.G., Wopenka B. and Weinbruch S. (1997b) Shock-induced high-pressure phase transformations in chondritic and differentiated meteorites: Solid-state transformations, high-pressure liquidus phases and alkali vapour fractionation (abs). *NIPR Sym. Antarctic Meteorites* 22nd, 27-30. Nat. Inst. Polar Res., Tokyo.  
Shergotty
- El Goresy A., Sharp T.G., Wopenka B. and Chen M. (1998a) A new very-high-pressure silica mineral in the Shergotty SNC meteorite: Implications for shock metamorphism and the Earth's lower mantle (abs#1707). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
Shergotty
- El Goresy A., Dubrovinsky L., Saxena S. and Sharp T.G. (1998b) A new post-stishovite silicon dioxide-polymorph with the baddelyite structure (Zirconium Oxide) in the SNC meteorite Shergotty: Evidence for extreme shock pressure (abs). *Meteoritics & Planet. Sci.* 33, A45.  
Shergotty
- El Goresy A., Kong P. and Palme H. (1999) Discovery of Cu-, Ni-, Zn-, Fe-metal alloy impregnations in the SNC meteorite Chassigny: Fingerprints of a pristine metallogenetic activity on the SNC parent body? (abs#1078). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM).  
Chassigny
- El Goresy A., Chen M., Gillet Ph. and Dubrovinsky L.S. (2000a) Shock-induced high-pressure phase transition of Labradorite to Hollandite in Zagami and the assemblage Hollandite + Jadeite in L Chondrites: Constraints to peak shock pressures (abs). *Meteoritics & Planet. Sci.* 35, A51.

Zagami

- El Goresy A., Dubrovinsky L., Sharp T.G., Saxena S.K. and Chen M. (2000b) A monoclinic post-stishovite polymorph of silica in the Shergotty meteorite. *Science* 288, 632-634.  
Shergotty
- El Goresy A., Graup G., and Chen M. (2003a) The assemblage maskelynite – post –stishovite silica polymorphs in the Shergotty meteorite: New stringent constraints to peak-shock pressures (abs). *Meteoritics & Planet. Sci.* 38, A50.  
Shergotty
- El Goresy A., Dubrovinsky L., Sharp T.G., Gillet Ph., Beck P. and Chen M. (2003b) A menagerie of shock-induced very dense minerals in SNC meteorites: Constraints to the pressure and temperature histories of shergottites (abs). International Symposium. *Evolution of Solar System: A New Perspective from Antarctic Meteorites*, 21-22. Nat. Inst. Polar Res., Tokyo.  
Y980459
- Elkins-Tanton L.T., Parmentier E.M. and Hess P.C. (2003a) A model for Martian magma ocean crystallization and overturn (abs #1479). *Lunar Planet. Sci. Conf.* XXXIV Lunar Planetary Institute, Houston (CD-ROM).
- Elkins-Tanton L.T., Parentier E.M. and Hess P.C. (2003b) Magma ocean fractional crystallization and cumulate overturn in terrestrial planets: Implications for Mars. *Meteoritics & Planet. Sci.* 38, 1753-1772.
- Eugster O. (1994) Orthopyroxenite ALH84001: Ejection from Mars (?) 15 Ma (abs). *Meteoritics* 29, 464.  
ALH84001
- Eugster O. and Weigel A. (1992) Exposure histories of lodranites, shergottite LEW88516 and CK-chondrites (abs). *Meteoritics* 27, 219.  
LEW88516
- Eugster O., Weigel A. and Polnau E. (1996) Two different ejection events for basaltic shergottites QUE94201, Zagami and Shergotty (2.6 Ma ago) and Iherzolitic shergottites LEW88516 and ALHA77005 (3.5 Ma ago) (abs). *Lunar Planet. Sci.* XXVII, 345-346. Lunar Planetary Institute, Houston (CD-ROM).  
QUE94201 Zagami Shergotty LEW88516 ALHA77005
- Eugster O. and Polnau E. (1997a) Mars-Earth transfer time of Iherzolite Yamato-793605 (abs). *Proc. NIPR Sym. Antarctic Meteorites* 22nd, 31-33. Nat. Inst. Polar Res., Tokyo.  
Y793605 ALH77005 LEW88516
- Eugster O. and Polnau E. (1997b) Mars-Earth transfer time of Iherzolite Yamato-793605. *Antarctic Meteorite Research* 10, 141-149. Nat. Inst. Polar Res., Tokyo.  
Y793605 ALH77005 LEW88516
- Eugster O., Weigel A. and Polnau E. (1997a) Ejection times of Martian meteorites. *Geochim. Cosmochim. Acta* 61, 2749-2757.  
EETA79001 QUE94201 Shergotty Zagami ALH77005 LEW88516 Chassigny Nakhla  
Govenador Valadares Lafayette ALH84001
- Eugster O., Polnau E. and Terribilini D. (1997b) Ejection age of Martian Iherzolite Yamato 793605, Chassigny, and Shergotty and crystallization age of shergotty maskelynite (abs). *Meteoritics & Planet. Sci.* 32, A40.  
Y793605 Chassigny Shergotty

Eugster O., Busemann H. and Lorenzetti S. (2002a) The pre-atmospheric size of Martian meteorites (abs#1096). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)  
Los Angeles QUE94201 Shergotty Zagami Nakhla Chassigny SaU005

Eugster O., Busemann H., Lorenzetti S. and Terribilini D. (2002b) Ejection ages from 81Kr-83Kr dating and pre-atmospheric sizes of Martian meteorites. *Meteoritics & Planet. Sci.* 37, 1345-1360.  
Los Angeles QUE94201 Shergotty Zagami Nakhla Chassigny ALH84001

Evans J.C. and Reeves J.H. (1984) Al-26 measurements on Antarctic meteorites (abs). *Lunar Planet. Sci.* XV, 260-261. Lunar Planetary Institute, Houston  
EETA79001 ALHA77005

Evans J. C., Wacker J. and Reeves J.H. (1992) Terrestrial ages of Victoria Land meteorites derived from cosmic-ray-produced radionuclides. In *Field and laboratory investigations of Antarctic meteorites collected by the United States expeditions 1985-1987*. (eds. Marvin and MacPherson) *Smithson. Contrib. Earth Sci.* 30, 45-56. Washington, DC. (*see Appendix III for address*)  
ALHA77005

Fallick A.E., Hinton R.W., Matthey D.P., Norris S.J., Pillinger C.T., Swart P.K. and Wright I.P. (1983) No unusual compositions of the stable isotopes of nitrogen, carbon and hydrogen in SNC meteorites (abs). *Lunar Planet. Sci.* XIV, 183-184. Lunar Planetary Institute, Houston  
Nakhla

Faquhar J., Thiemens M.H. and Jackson T. (1998a) Delta<sup>17</sup>O measurements of carbonates from ALH84001: Implications for oxygen cycling between the atmosphere-hydrosphere and pedosphere of Mars (abs#1872). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Farquhar J., Thiemens M.H. and Jackson T. (1998b) Atmosphere-surface interactions on Mars: Delta<sup>17</sup>O measurements of carbonate from ALH 84001. *Science* 280, 1580-1582.  
ALH84001

Farquhar J., Thiemens M.H., and Jackson T.L. (1999) Delta<sup>17</sup>O anomalies in carbonate from Nakhla and Lafayette and delta<sup>33</sup>S anomalies in sulfur from Nakhla: Implications for atmospheric chemical interactions with the Martain regolith (abs#1675). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM).  
Nakhla Lafayette

Farquhar J., Savarino J., Jackson T.L. and Thiemens M.H. (2000a) Evidence of atmospheric sulfur in SNC meteorites: Implications for the Martain sulfur cycle (abs#1275). *Lunar Planet. Sci.* XXXI Lunar Planetary Institute, Houston (CD-ROM).  
Nakhla Lafayette Shergotty Zagami EETA79001

Farquhar J., Savarino J., Jackson T. L. and Thiemens M.H. (2000b) Evidence of atmospheric sulphur in the Martian regolith from sulphur isotopes in meteorites. *Nature* 404, 50-52.  
EETA79001 Zagami Shergotty Lafayette Nakhla

Farquhar J. and Thiemens M.H. (2000) Oxygen cycle of the Martian atmosphere-regolith system: delta<sup>17</sup>O of secondary phases in Nakhla and Lafayette. *J. Geophys. Res.* 105, 11,991-11,997.  
Nakhla Lafayette

Farquhar J., Savarino J., Airieau S. and Thiemens M.H. (2001a) Observations of wavelength-sensitive mass-independent sulfur isotopic effects during SO<sub>2</sub> photolysis: Implications for sulfur isotope compositions of SNC meteorites and ancient terrestrial samples (abs#1750). *Lunar Planet. Sci.* XXXII

Lunar Planetary Institute, Houston. (CD-ROM)  
Nakhla ALH84001

Faquhar J., Bao H. and Thiemens M.H. (2001b) Implications of recent observations of mass-independent sulfur and oxygen isotope fractionations in terrestrial samples for interpretations SNC meteorites (abs #1756). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM).

Faquhar J., Kim S.T. and Masterson A. (2007) Implication form sulfur isotopes of the Nakhla meteorite for the origin of sulfate on Mars. *Earth Planet. Sci. Lett.* 264, 1-8.  
Nakhla

Fedden F. (1880) *Catalog Meteorites Indian Museum.* Calcutta.  
Shergotty

Feierberg M.A. and Drake M.J. (1980) The meteorite-asteroid connection: The infrared spectra of eucrites, shergottites and Vesta. *Science* 209, 805-807.  
Shergotty ALHA77005

Fei Y. and Bertka C.M. (2003) Experimental constraints on the thermal structure of the Martian interior and Martian magmatism (abs#1829). *Lunar Planet. Sci. Conf.* XXXIV, Lunar Planetary Institute, Houston (CD-ROM).

Filiberto J., Nekvasil H. and Lindsley D.H. (2005) An experimental crystallization study of a proposed high-Fe, low-Al Martian mparental liquid at elevated pressure (abs#1359). *Lunar Planet. Sci.* XXXVI CD-ROM, Lunar Planet. Institute, Houston.

Filiberto J. and Nekvasil H. (2005) Are the SNC meteorites clearly distinct from terrestrial rocks? (abs#5189) *Meteoritics & Planet. Sci.* 40, A48.

Filiberto J., Nekvasil H. and Lindsley D.H. (2006a) The Mars/Earth dichotomy in Mg/Si and Al/Si ratios Is it real? *Am. Mineral.* 91, 471-474.

Filiberto J., Nekvasil H., McCubbin F. and Lindsley D.H. (2006b) Are terrestrial ferropicrites analogs of Martian rocks (abs #1081)? *Lunar Planet. Sci.* XXXVII Lunar Planetary Institute, Houston.

Filiberto J. and Treiman A.H. (2009) Martian magmas: Water-poor but chlorine-rich (abs#1449). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.

Fisler D.K., Cygan R.T. and Westrich H.R. (1997) Cation diffusion in carbonate minerals: Determining closure temperatures and the thermal history for the ALH 84001 meteorite (abs). In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life.* (eds. Clifford et al.) *LPI Contribution* 916, 32. Lunar Planetary Institute, Houston.  
ALH84001

Fishler D.K. and Cygan R.T. (1998) Cation diffusion in calcite: Determining closure temperatures and the thermal history for the Allan Hills 84001 meteorite. *Meteoritics & Planet. Sci.* 33, 785-789.  
ALH84001

Floran R.J., Prinz M., Hlava P.F., Keil K., Nehru C.E. and Hinckley J.R. (1977) Chassigny revisited: A cumulate dunite with hydrous amphibole-bearing melt inclusions (abs). *Meteoritics* 12, 225-226.  
Chassigny

Floran R.J., Prinz M., Hlava P.F., Keil K., Nehru C.E. and Hinckley J.R. (1978) The Chassigny meteorite: A cumulate dunite with hydrous amphibole-bearing melt inclusions. *Geochim. Cosmochim.*

*Acta* 42, 1213-1229.

Chassigny

Flynn G.J., Keller L.P., Kirz J., Wirick S., Bajt S. and Chapman H.N. (1997a) Carbon mapping and carbon-Xanes measurements of carbonate globules from ALH84001 (abs). *Lunar Planet. Sci.* XXVIII, 365-366. Lunar Planetary Institute, Houston  
ALH84001

Flynn G.J., Sutton S.R. and Keller L.P. (1997b) Element abundance patterns in carbonate globules and rims from ALH84001 (abs). *Lunar Planet. Sci.* XXVIII, 367-368. Lunar Planetary Institute, Houston  
ALH84001

Flynn G.J., Keller L.P., Jacobsen C., Wirick S., Bajt S. and Chapman H. N. (1997c) The spatial distribution and bonding states of carbon associated with Allan Hills 84001 carbonates (abs). *Meteoritics & Planet. Sci.* 32, A42.  
ALH84001

Flynn G.J., Keller L.P., Miller M.A., Jacobsen C. and Wirick S. (1998a) Organic compounds associated with carbonate globules and rims in the ALH84001 meteorite (abs#1156). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM)  
ALH84001

Flynn G.J., Keller L.P., Jacobsen C. and Wirick S. (1998b) Carbon in Allan Hills 84001 carbonate and rim (abs). *Meteoritics Planet. Sci.* 33, A50-51.  
ALH84001

Flynn G.J., Keller L.P., Jacobsen C. and Wirick S. (1999) Organic carbon in Mars meteorites: A comparison of ALH84001 and Nakhla (abs#1087). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001 Nakhla

Flynn G.J., Keller L.P., Jacobsen C. and Wirick S. (2000) Organic carbon in carbonate and rim from ALH84001 (abs). *Workshop on the Issue Martian Meteorites: Where - - - #7013.* Lunar Planetary Institute, Houston.  
ALH84001

Flynn G.J., Sutton S.R. and Keller L.P. (2002) X-ray microprobe measurements of the chemical compositions of ALH84001 carbonate globules (abs#1648). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)  
ALH84001

Folco L., Franchi I.A., Scherer P., Schultz L. and Pillinger C.T. (1999) Dar al Gani 489 basaltic Shergottite: A new find from the Sahara likely paired with Dar al Gani 476 (abs). *Meteoritics & Planet. Sci.* 34, A36-37.  
DaG489

Folco L. and Franchi I.A. (2000) Dar al Gani 670 Shergottite: A new fragment of the Dar al Gani 476/489 Martian meteorite (abs). *Meteoritics & Planet. Sci.* 35, A54-55.  
DaG670

Folco L. and Rastelli N. (2000) The meteorite collection of the Museo Nazionale dell'Antartide in Siena (abs). *Meteoritics & Planet. Sci.* 35, A189-198.  
DaG489

Folco L. and Mellini M. (2000) 1990-2000: Ten years of Antarctic meteorite search by Italian PNRA

(abs). Antarctic Meteorites XXV. NIPR, Tokyo.

Folco L., Franchi I.A., D’Orazio M., Rocchi S. and Schultz L. (2000) A new Martian meteorite from the Sahara: The shergottite Dar al Gani 489. *Meteoritics & Planet. Sci.* 35, 827-839.  
DaG489

Folco L., Capra A., Chiappini M., Frezzotti M., Mellini M. and Tabacco I.E. (2002) The Frontier Mountain meteorite trap (Antarctica). *Meteoritics & Planet. Sci.* 37, 209-228.

Foley C.N., Humayun M., Davis A.M. and Kagan O. (1998) Chemical and SEM studies of mineral assemblages within ALH84001 (abs#1928). *Lunar Planet. Sci. XXIX* Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Foley C.N., Wadhwa M. and Janney P.E. (2003) Tungsten isotopic composition of the SNC meteorite Los Angeles: Further implications for early differentiation (abs #2117). *Lunar Planet. Sci. Conf. 34<sup>th</sup>*, Lunar Planetary Institute, Houston (CD-ROM).  
Los Angeles

Foley C.N., Economou T.E. and Clayton R.N. (2001) (abs) XXXII #1979

Foley C.N., Economou T.E. and Clayton R.N. (2002) (abs) XXXIII #2073

Foley C.N., Economou T.E. and Clayton R.N. (2003) Final chemical results from the Mars: Pathfinder alpha proton X-ray spectrometer. *J. Geophy. Res.* 108 (12), 8096.

Foley C.N., Wadhwa M. and Jannery P.E. (2003) Tungsten isotopic compositions of the SNC meteorites: Further implications for early differentiation history of Mars (abs#3163). Sixth International Conf. on Mars.  
Los Angles Zagami NWA998

Foley C.N., Wadhwa M., Borg L.E. and Janney P.E. (2004) The differentiation histroy of mantle resovoirs on mars from W and Nd isotopic compositions of SNC meteorites (abs#1879). *Lunar Planet. Sci. XXXV* Lunar Planetary Institute, Houston. (CD-ROM)

Foley C. Nicole, Wadhwa M., Borg L.E., Janney P.E., Hines R. and Grove T.L. (2005) The early differentiation history of Mars from  $^{182}\text{W}$ - $^{142}\text{Nd}$  isotope systematics in the SNC meteorites. *Geochim. Cosmochim. Acta.* 69, 4557-4571.

Folk R.L., Taylor L.A. and Nazarov M.A. (2001) Similarity of nanometer-size spheroids in Martian meteorite Dhofar 019 & enclosing calichi soil: South-Pole vs. Desert forms (abs#1777). *Lunar Planet. Sci. XXXII* Lunar Planetary Institute, Houston. (CD-ROM)  
Dho019

Folk R.L. and Taylor L.A. (2002) Nanobacterial alteration of pyroxene in Martian meteorite ALH84001. *Meteoritics Planet. Sci.* 37, 1057-1069.  
ALH84001

Ford D. J. and Rutherford M. J. (1993) Primitive SNC parent magmas and crystallization: low pH<sub>2</sub>O experiments (abs). *Lunar Planet. Sci. XXIV*, 503-504. Lunar Planetary Institute, Houston

Forsythe R.D. and Zimbelman J.R. (1995) A case for ancient evaporite basins on Mars. *J. Geophy. Res.* 100, 5553-5563.

Franchi I. A., Sexton A. S., Wright I.P. and Pillinger C.T. (1997) A refinement of oxygen isotopic

composition of Mars (abs). *Lunar Planet. Sci.* XXVIII, 379-380. Lunar Planetary Institute, Houston  
ALHA77005 EETA79001 QUE94201 Shergotty Zagami Lafayette Nakhla Governador  
Valadares Chassigny ALH84001

Franchi I.A., Wright I.P., Sexton A.S. and Pillinger C.T. (1999) The oxygen-isotopic composition of Earth and Mars. *Meteoritics & Planet. Sci.* 34, 657-661.

Franck S. (1997) SNC meteorites and the magnetic field strength history of Mars (abs). *Meteoritics & Planet. Sci.* 32, A44-45.  
ALH84001

Franz H.B., Farquhar J. and Kim S.T. (2008) Sulfur isotopic composition of multiple mineral phases in shergottites (abs#2433). *Lunar Planet. Sci.* XXXIX. Lunar Planet. Inst. Houston.  
RBT04261 LAR 06319 EETA79001 ALH77005

French B., MacPherson G. and Clarke R. (1990) *Antarctic meteorite teaching collection: Educational meteorite thin sections. Draft available from JSC Curator's Office*, Houston.  
EETA79001

Freundel M., Schultz L. and Reedy R.C. (1986) Terrestrial  $^{81}\text{Kr}$ - $^{83}\text{Kr}$  ages of Antarctic meteorites. *Geochim. Cosmochim. Acta* 50, 2663-2673.

Friedman R.C., McCoy T.J. and Taylor G.J. (1994) Constraints on the physical details of nakhelite formation (abs). *Lunar Planet. Sci.* XXV, 391-392. Lunar Planetary Institute, Houston  
Nakhla

Friedman R.C., Taylor G.J. and Treiman A.H. (1995) Processes in thick lava flows: Nakhrites (Mars) and Theo's flow (Ontario, Earth) (abs). *Lunar Planet. Sci.* XXVI, 429-430. Lunar Planetary Institute, Houston  
Nakhla

Friedman R.C., Taylor G.J. and Treiman A.H. (1998) Nakhrites and Theo's flow: Formation of extrusive pyroxenites (abs#1190). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).

Friedman-Lentz R.C., Taylor G.J. and Treiman A.H. (1999) Formation of a Martian pyroxenite: a comparative study of the nakhelite meteorites and Theo's Flow. *Meteoritics & Planet. Sci.* 34, 919-932.

Friedman E.I., Wierzchos J. and Ascaso C. (1998) Chains of magnetite crystals in ALH84001: Evidence of biological origin (abs). *Workshop on the Issue Martian Meteorites: Where - - - #7018*. Lunar Planetary Institute, Houston.  
ALH84001

Friedmann E.I., Wierzchos J., Ascaso C. and Winklhofer M. (2001a) Chains of magnetite crystals in the meteorite ALH84001: Evidence of biological origin (abs#1996). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
ALH84001

Friedmann E.I., Wierzchos J., Ascaso C. and Winklhofer M. (2001b) Chains of magnetite crystals in the meteorite ALH84001. *Proc. Nat. Acad. Science USA* 98, 2176-2181.  
ALH84001

Fries M., Mysen B., Vicenzi E., Rost D. and Steele A. (2006) Hydrated phosphates in nakhelite MIL03346 (abs#1180). *Lunar Planet. Sci. Conf.* XXXVII Lunar Planetary Institute, Houston  
MIL03346

Fritz J., Greshake A., Hecht L. and Stöffler D. (2002) Shock metamorphism of Martian meteorites: New data from quantitative shock barometry (abs#1504). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)  
Shergotty Zagami EETA79001 SaU005 DaG476 ALH77005

Fritz J., Greshake A. and Stöffler D. (2003) Launch conditions for Martian meteorites: Plagioclase as a shock pressure barometer (abs#1335). *Lunar Planet. Sci.* XXXIV Lunar Planetary Institute, Houston.

Fritz J., Greshake A. and Stöffler D. (2005a) Micro-Raman spectroscopy of plagioclase and maskelynite in Martian meteorites: Evidence of progressive shock metamorphism. *Antarct. Meteorite Res.* 18, 96-116. Nat. Inst. Polar Res., Tokyo.

Fritz J., Artemieva N. and Greshake A. (2005b) Ejection of Martian meteorites. *Meteoritics & Planet. Sci.* 40, 1393-1411. (*hey, this is a good paper!*)

Fritz J. and Greshake A. (2009) Petrographic constraints on shock induced P/T conditions in shergottites (abs#1581). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.

Fuchs L.H. (1962) Occurrence of whitlockite in chondritic meteorites. *Science* 137, 425-426.  
Shergotty

Fuchs L.H. (1969) The phosphate mineralogy of meteorites. In *Meteorite Research*. (ed. Millman) page 683-695. Springer-Verlag, N.Y.  
Shergotty

Fudali R.F. and Schutt J.W. (1989) The field season in Victoria land, 1983-1984. In *Field and laboratory investigations of meteorites from Victoria Land and the Thiel Mountains Region, Antarctica 1982-1983 and 1983-1984*. (eds. Marvin and MacPherson) *Smithson. Contrib. Earth Sci.* 28, 23-28. Washington, DC.

Fuse K. and Anders E. (1969) Aluminium-26 in meteorites VI Achondrites. *Geochim. Cosmochim. Acta* 33, 653-670.  
Nakhla Lafayette Shergotty

Gaffney Amy M., Borg Lars E. and Connelly J.N. (2006) U-Pb isotopic systematics of QUE94201: Seeing through terrestrial Pb contamination to identify and even lower-Mu source on Mars (abs#1483). *Lunar Planet. Sci.* XXXVII Lunar Planetary Institute, Houston (CD-ROM).  
QUE94201

Gaffney A.M., Borg L.E. and Connelly J.N. (2007) Uranium-lead isotope systematics of Mars inferred from the basaltic shergottite QUE 94201. *Geochim. Cosmochim. Acta* 71, 5016-5031.  
QUE94201

Gale N.H., Arden J.W. and Hutchison R. (1975) The chronology of the Nakhla achondritic meteorite. *Earth Planet. Sci. Lett.* 26, 195-206.  
Nakhla

Galenas M.G., Jones J.H. and Danielson L.R. (2009) Experimental crystallization of Yamato 980459 (abs#1920). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.

Ganapathy R. and Anders E. (1969) Ages of calcium-rich achondrites- II Howardites, nakhellites and the Angra dos Reis angrite. *Geochim. Cosmochim. Acta* 33, 775-787.  
Nakhla Lafayette

Gao X. and Thiemens M. (1990) Sulfur isotopic studies in meteorites (abs). *Lunar Planet. Sci.* XXI, 401-402. Lunar Planetary Institute, Houston (CD-ROM).  
ALHA77005

Garrison D.H., Rao M.N. and Bogard D.D. (1994) Solar proton produced neon in shergottite meteorites (abs). *Lunar Planet. Sci.* XXV, 403-404. Lunar Planetary Institute, Houston (CD-ROM).  
ALHA77005

Garrison D.H., Rao M.N. and Bogard D.D. (1995) Solar-proton-produced neon in shergottite meteorites and implications for their origin. *Meteoritics* 30, 738-747.  
ALHA77005

Garrison D.H. and Bogard D.D. (1997) Argon-39/Argon-40 dating of Martian meteorites (abs). *Meteoritics & Planet. Sci.* 32, A45.  
ALH84001 Zagami QUE94201

Garrison D.H. and Bogard D.D. (1998) Isotopic composition of trapped and cosmogenic noble gases in several Martian meteorites. *Meteoritics & Planet. Sci.* 33, 721-736.  
Shergotty Y793605 ALH84001 QUE94201 EETA79001

Garrison D.H. and Bogard D.D. (2000) Cosmogenic and trapped Noble gases in the Los Angeles Martian meteorite (abs). *Meteoritics & Planet. Sci.* 35, A58.  
Los Angeles

Garrison D.H. and Bogard D.D. (2001) Argon-39-argon-40 “ages” and trapped argon for three Martian Shergottites (abs). *Meteoritics & Planet. Sci.* 36, A62-63.  
Los Angeles DaG476 Dho019

Garrison D.H. and Bogard D.D (2005) Ar-Ar ages of nakhlites Y000593, NWA998 and Nakhla and CRE age of NWA998 (abs#1137). *Lunar Planet. Sci.* XXXVI Lunar Planet. Institute, Houston.  
Y000593 NWA998 Nakhla

Geiss J. and Hess D.C. (1958) Argon-potassium ages and the isotopic composition of argon from meteorites. *Ap. J.* 127, 224-236.  
Shergotty

Gellert R. and eleven authors (2006) Alpha particle X-ray spectrometer (APX): Results from Gusev crater and calibration report. *J. Geophys. Res.* 111, E02S05

Ghadi A.M., Aghreb A.E. Abu, Schlüter J., Schultz L. and Thiedig F. (2003) The Dar al Gani meteorite field in the Libyan Sahara (abs). *Meteoritics & Planet. Sci.* 38, A49.

Ghosal S., Sack R.O., Ghiorso M.S. and Lipschutz M.E. (1997) Shergottite evidence for a reduced, iron-depleted Martian mantle (abs). *Meteoritics & Planet. Sci.* 32, A46.

Ghosal S., Sack R.O., Ghiorso M.S. and Lipschutz M.E. (1998) Evidence for a reduced, Fe-depleted Martian mantle source region of shergottites. *Contrib. Mineral Petro.* 130, 346-357.

Ghosh A., Nimmo F. and McSween H.Y. (2003) The effect of early accretion and redistribution of 26Al on the thermal evolution of Mars (abs #2011). *Lunar Planet. Sci. Conf.* 34<sup>th</sup> Lunar Planetary Institute, Houston (CD-ROM).

Gibbs W.W. (1998) Endangered. *Scientific American* April 1998, pp19-20. (news article)  
ALH84001

Gibson E.K. (2001) Martian meteorites unveil secrets of the red planet (abs). *Meteoritics & Planet. Sci.* 36, A64-65.

Gibson E.K. and Moore C.B. (1983) Sulfur in achondritic meteorites (abs). *Lunar Planet. Sci. XIV*, 247-248. Lunar Planetary Institute, Houston

Gibson E.K., Moore C.B., Primus T. M. and Lewis C. F. (1985) Sulfur in achondritic meteorites. *Meteoritics* 20, 503-511.  
Shergotty Zagami EETA79001 Chassigny Nakhla Lafayette

Gibson E.K., McKay D.S., Thomas-Keprta K.L. and Romanek C.S. (1996) Evaluating the evidence for past life on Mars: Response. *Science* 274, 2125.  
ALH84001

Gibson E.K., McKay D.S., Thomas-Keprta K.L., Romanek C.S., Clemett S.J., Zare R.N. and Vali H. (1997a) Possible relic biogenic activity in Martian meteorite ALH84001: A current assessment (abs). *Lunar Planet. Sci. XXVIII*, 413-414. Lunar Planetary Institute, Houston  
ALH84001

Gibson E.K., McKay D.S., Thomas-Keprta K.L., Romanek C.S., Clemett S.J. and Zare R.N. (1997b)  
Biogenic activity in Martian meteorite ALH84001 - status of the studies (abs). In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life.* (eds. Clifford et al.) *LPI Contribution* 916, 35. Lunar Planetary Institute, Houston.  
ALH84001

Gibson E.K., Romanek C.S., McKay D.S., Thomas-Keprta K.L., Allen C.C. and Wentworth S. (1997c)  
Nature of carbon phases in Allan Hills 84001 (abs). *Meteoritics & Planet. Sci.* 32, A47.  
ALH84001

Gibson E.K., McKay D.S., Thomas-Keprta K.L. and Romanek C.S. (1997d) The case for relic life on Mars. *Scientific American* 277, 58-65.  
ALH84001

Gibson E.K., McKay D.S. and Thomas-Keprta K.L. (1998a) Exobiological features within ALH84001: Current observations (abs#1433). *Lunar Planet. Sci. XXIX* Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Gibson E.K., McKay D.S., Thomas-Keprta K.L., Westall F. and Romanek C.A. (1998b) How do the properties of ALH84001 compare with accepted-criteria for evidence of ancient life? (abs) *Workshop on the Issue Martian Meteorites: Where - - - #7010.* Lunar Planetary Institute, Houston.  
ALH84001

Gibson E.K., McKay D.S. and Thomas-Keprta K.L. (1998c) The case for life on Mars, Part 2: data support the hypothesis. *BioAstronomy News* 10, 1-8.

Gibson E.K., McKay D.S. and Thomas-Keprta K.L. (1999a) Life on Mars: Evidence within Martin meteorites. (ed. Zubrin) *Proc. Founding Convention of Mars Soc.* part II, 437-447. Univelt, San Diego.

Gibson E.K., McKay D.S., Thomas-Keprta K.L., Westfall F. and Romanek C.S. (1999b) Criteria for evidence of ancient life: How does the data from ALH84001 compare with accepted requirements? (abs#1174) *Lunar Planet. Sci. XXX* Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Gibson E.K., McKay D.S., Thomas-Keprta K.L., Westall F. and Clemett S.J. (2000) What is the status of the hypothesis of evidence of biogenic activity within Martian meteorites: Alive or dead? (abs) *Meteoritics & Planet. Sci.* 35, A60.  
ALH84001 Nakhla Shergotty

Gibson and eight authors (2000) Life on Mars. *Precambrian Research* 106, 15-34.  
ALH84001 Nakhla Shergotty

Gibson E.K., Socki R.A., Wentworth S.J., Romanek C.S. and McKay D.S. (2005) Record of water in Martian meteorites and the history of Mars (abs#5042). *Meteoritics & Planet. Sci.* 40, A55.  
ALH84001

Gibson E.K. and 10 authors (2006) Observation and analysis of *In Situ* carbonaceous matter in Nakhla: Part II (abs#2039). *Lunar Planet. Sci.* XXXVII Lunar Planetary Institute, Houston (CD-ROM).  
Nakhla

Gibson and 14 authors (2007) Identification and analyses of in situ carbon-bearing phases in Nakhla (abs#5045). *Meteoritics & Planet. Sci.* 42, A55.  
Nakhla

Gildea K.J., Holland G., Lyon I.C., Chatzitheodoridis E. and Burgess R. (2006) High calcium late stage carbonate in ALH84001 (abs#1776). *Lunar Planet. Sci.* XXXVII Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Gillet P., Barrat J.A., Heulin T., Achouak W., Lesourd M., Guyot F. and Benzerara K. (2000) Bacteria in the Tatahouine meteorite: nanometric-scale life in rocks. *Earth Planet. Sci. Lett.* 175, 161-167.

Gillet P., Barrat J.A., Crozaz G., Deloule E., Jambon A., Neuville D., Sautter V. and Wadhwa M. (2001) Aqueous alterations in the NWA817 Martian meteorite (abs). *Meteoritics & Planet. Sci.* 36, A66.  
NWA817

Gillet P., Barrat J.A., Deloule E., Wadhwa M., Jambon A., Sautter V., Devouard B., Neuville D., Benzerara K. and Lesourd M. (2002) Aqueous alteration in the Northwest Africa 817 (NWA 817) Martian meteorite. *Earth Planet. Sci. Lett.* 203, 431-444.  
NWA817

Gillet P., Barrat J.A., Beck P., Marty B., Greenwood R.C., Franchi I.A., Bohn M. and Cotton J. (2005) Petrology, geochemistry and cosmic-ray exposure age of lherzolitic shergottite Northwest Africa 1950. *Meteoritics & Planet. Sci.* 40, 1175-1184.  
NWA1950

Gilmour J.D., Whitby J.A., Ash R.D. and Turner G. (1995) Xenon isotopes in irradiated and unirradiated samples of Allan Hills 84001 (abs). *Meteoritics* 30, 510-511.  
ALH84001

Gilmour J.D., Whitby J.A. and Turner G. (1996) Carrier phases of Xenon in ALH84001 (abs). *Meteoritics & Planet. Sci.* 31, A51.  
ALH84001

Gilmour J.D., Lyon I.C., Saxton J.M., Turner G. and Whitby J. A. (1997a) Oxygen and noble gas isotope constraints on the origin of ALH84001 carbonate (abs). *Lunar Planet. Sci.* XXVIII, 421-422. Lunar Planetary Institute, Houston.  
ALH84001

Gilmour J.D., Wogelius R.A., Grime G.W. and Turner G. (1997b) Major- and trace-element distributions in ALH84001 carbonate: Implications of a high temperature (abs). In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life.* (eds. Clifford et al.) *LPI Contribution* 916, 37. Lunar Planetary Institute, Houston.  
ALH84001

Gilmour J.D., Wogelius R.A., Grime G.W. and Turner G. (1997c) Trace- and major-element zoning in Allan Hills 84001 carbonate (abs). *Meteoritics & Planet. Sci.* 32, A48-49.  
ALH84001

Gilmour J.D., Burgess R., Whitby J.A. and Turner G. (1998a) Soluble phaes in Nakhla, their Ar-Ar ages and noble gas contents (abs#1788). *Lunar Planet. Sci. XXIX* Lunar Planetary Institute, Houston (CD-ROM).  
Nakhla

Gilmour J.D., Whitby J.A. and Turner G. (1998b) The siting of Martian xenon in Nakhla (abs). *Meteoritics & Planet. Sci.* 33, A59.  
Nakhla

Gilmour J.D., Whitby J.A. and Turner G. (1998c) Xenon isotopes in irradiated ALH84001: Evidence for shock-induced trapping of ancient Martian atmosphere. *Geochim. Cosmochim. Acta* 62, 2555-2571.  
ALH84001

Gilmour J.D., Whitby J.A., Burgess R. and Turner G. (1998d) Xenon and argon isotopes in irradiated, etched Nakhla: Characterising the host of Martian atmospheric Xenon (abs). *Workshop on the Issue Martian Meteorites: Where - - - #7019.* Lunar Planetary Institute, Houston.  
Nakhla

Gilmour J.D., Whitby J.A. and Turner G. (1999a) Comparative iodine geochemistry of Earth and Mars: A Possible biomarker? (abs#1661) *Lunar Planet. Sci. XXX* Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Gilmour J.D., Whitby J.A. and Turner G. (1999b) Martian atmospheric xenon contents of Nakhla mineral separates: implications for the origin of elemental mass fractionation. *Earth Planet. Sci. Lett.* 166, 139-148.  
Nakhla

Gilmour J.D., Whitby J.A. and Turner G. (2000) Extraterrestrial Xenon components in Nakhla (abs#1513). *Lunar Planet. Sci. XXXI* Lunar Planetary Institute, Houston (CD-ROM).  
Nakhla

Gilmour J.D., Whitby J.A. and Turner G. (2001) Disentangling xenon components in Nakhla: Martian atmosphere, spallation and Martian interior. *Geochim. Cosmochim. Acta* 65, 343-354.  
Nakhla

Gladman B. and Burns J.A. (1996) Towards a self-consistent model of lunar and Martian meteorite delivery (abs). *Lunar Planet. Sci. XXVII*, 421-422. Lunar Planetary Institute, Houston

Gladman B., Burns J.A., Duncan M., Lee P. and Levinson H.F. (1996) The exchange of impact ejecta between terrestrial planets. *Science* 271, 1387-1390.

Gladman B. (1997) Destination: Earth. Martian meteorite delivery. *Icarus* 130, 228-246.

Glavin D.P., Bada J.L., Brinton K.L.F., McDonald G.D. (1999) Amino acids in the Martian meteorite

Nakhla. *Proc. Natl. Acad. Sci.* 96, 8835-8838.  
Nakhla

Gleason J.D., Kring D.A. and Boynton W.V. (1995) Shergottite mixing relations, partial melting models, and the neodymium evolution of the Martian mantle (abs). *Meteoritics* 30, 511.

Gleason J.D., Kring D.A. and Boynton W.V. (1996) The role of garnet in Martian mantle evolution: Further evidence from shergottite rare earth patterns (abs). *Lunar Planet. Sci.* XXVII, 425-426.

Gleason J.D., Kring D.A. and Boynton W.V. (1997a) Divergent mantle evolution on Earth and Mars and the origin of depleted planetary mantles (abs). *7th Goldschmidt Conf., LPI Contribution* 921, 81. Tucson.

Gleason J.D., Kring D.A., Hill D.H. and Boynton W.V. (1997b) Petrography and bulk chemistry of Martian orthopyroxenite ALH 84001: Implications for the origin of secondary carbonates. *Geochem. Cosmochim. Acta* 61, 3503-3512.  
ALH84001

Gleason J.D., Kring D.A., Hill D.H. and Boynton W.V. (1997c) Petrography and bulk chemistry of Martian lherzolite LEW88516. *Geochem. Cosmochim. Acta* 61, 4007-4014.  
LEW88516

Gnos E., Hofmann B., Franchi I.A., Al-Kathiri A., Hauser M. and Moser L. (2002) Sayh al Uhaymir 094 – a new Martian meteorite from the Oman desert. *Meteoritics & Planet Sci.* 37, 835-854.  
SaU094

Gnos E., Hofmann B., Villa I.M. and Al-Kathiri A. (2002) Sayh al Uhaymir 094 – a new Martian meteorite from the Oman desert (abs). 12<sup>th</sup> Goldschmidt Conf. *Geochem. Cosmochim. Acta* 66, A280. Davos  
SaU094

Golden D.C., Thomas-Keprta K.L., McKay D.S., Wentworth S.J., Vali H. and Ming D.W. (1997) Size distribution of magnetite in carbonate globules of ALH84001 Martian meteorite (abs). *Lunar Planet. Sci.* XXVIII, 427-428. Lunar Planetary Institute, Houston  
ALH84001

Golden D.C., Ming D.W., Schwandt C.S., Morris R.V., Yang S.V. and Lofgren G.E. (1999a) An experimental study of kinetically-driven precipitation of Ca-Mg-Fe carbonates from solution: Implications for the low-temperature formation of carbonates in Martian meteorite ALH84001 (abs#1973). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Golden D.C., Ming D.W., Schwandt C.S., Morris R.V., Yang S.V. and Lofgren G. E. (2000a) An experimental study of kinetically-driven precipitation of calcium-magnesian-iron carbonates from solution: Implications for the low-temperature formation of carbonates in Martian meteorite ALH84001. *Meteoritics & Planet. Sci.* 35, 7457-465.  
ALH84001

Golden D.C., Ming D.W., Schwandt C.S., Lauer H.V., Socki R.A., Morris R.V., Lofgren G.E. and McKay G.A. (2000b) Inorganic formation of zoned Mg-Fe-Ca carbonate globules with magnetite and sulfide rims similar to those in Martian meteorite ALH84001 (abs#1799). *Lunar Planet. Sci.* XXXI Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Golden D.C. and six authors (2001a) Comparison of carbonate globules synthetically by hydrothermal

precipitation with Martian meteorite ALH84001 carbonate globules (abs#2054). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
ALH84001

Golden D.C., Ming D.W., Schwandt C.S., Lauer H.V., Socki R.A., Morris R.V., Lofgren G.E. and McKay G.A. (2001b) A simple inorganic process for the formation of carbonates, magnetite, and sulfides in Martian meteorite ALH84001. *Amer. Mineral.* 86, 370-375.  
ALH84001

Golden D.C. and seven authors (2001c) Erratum to “A simple inorganic process for the formation of carbonates, magnetites and sulfides in Martian meteorite ALH84001”. *Amer. Mineral.* 86, 956.

Golden D.C., Ming D.W., Lauer H.V., Schwandt C.S., Morris R.V., Lofgren G.E. and McKay G.A. (2002a) Inorganic formation of “Truncated hexa-octahedral” magnetite: Implications for inorganic processes in Martian meteorite ALH84001 (abs#1933). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)  
ALH84001

Golden D.C., Ming D.W., Zolensky M.E., Lauer H.V. Jr., Schwandt C.S., Morris R.V., Lofgren G.E. and McKay G.A. (2002b) Morphology of magnetite formed via thermal decomposition of sidertite: Implications for inorganic formation of magnetite in Martian meteorite ALH84001 (abs). *Meteoritics & Planet. Sci.* 37, A53.  
ALH84001

Golden and nine authors (2003) Morphological evidence for an exclusively inorganic origin for magnetite in Martian meteorite ALH84001 (abs#1970). *Lunar Planet. Sci.* XXXIV Lunar Planetary Institute, Houston  
ALH84001

Golden D.C., Ming D.W., Lauer H.V. and Morris R.V. (2004) Thermal decomposition of siderite-pyrite assemblages: Implications for sulfide mineralogy in Martian meteorite ALH 84001 carbonate globules (abs#1396). *Lunar Planet. Sci.* XXXV Lunar Plant. Inst., Houston. (CD-ROM)  
ALH84001

Golden and nine authors (2004) Evidence for exclusively inorganic formation of magnetite in Martian meteorite ALH84001. *Amer. Mineral.* 89, 681-695.  
ALH84001

Golden D.C., Ming D.W., Lauer H.V., Morris R.V., Treiman A.H. and McKay G.A. (2006) Formation of “Chemically Pure” magnetite from Mg-Fe-Carbonates: Implications for the exclusively inorganic origin of magnetite and sulfides in Martian meteorite ALH84001 (abs). *Lunar Planet. Sci.* XXXVII Lunar Plant. Inst., Houston. (CD-ROM)  
ALH84001

Gomez C.B. and Keil K. (1980) *Brazilian stone meteorites*. Univ. New Mexico Press, ABQ, 161 pages. Governador Valadares

Gooding J.L. (1978) Chemical weathering on Mars: Thermodynamic stabilities of primary minerals (and their alteration products) from mafic rocks. *Icarus* 33, 483-513.

Gooding J.L. (1984a) Low-temperature aqueous alteration in the early solar system: Possible clues from meteorites weathered in Antarctica (abs). *Lunar Planet. Sci.* XV, 308-309. Lunar Plant. Inst., Houston

Gooding J.L. (1984b) Search for “Martian(?) weathering” effects in achondrites EETA79001 and

ALHA77005: Complications from Antarctic weathering (abs). *Lunar Planet. Sci.* XV, 310-311.  
Lunar Plan. Inst., Houston  
EETA79001 ALHA77005

Gooding J.L. (1984c) Do igneous rocks fall from Mars and beyond? *Geotimes* 29, 29.

Gooding J.L. (1986) Clay-mineraloid weathering products in Antarctic meteorites. *Geochem. Cosmochim. Acta* 50, 2215-2223.

Gooding J.L. (1987) Are SNCs smoked or salted? *Geotimes* 32, 10-11.

Gooding J.L. (1988) Significance of terrestrial weathering effects in Antarctic meteorites. In *Field and laboratory investigations of meteorites from Victoria Land and the Thiel Mountains Region, Antarctica 1982-1983 and 1983-1984*. (eds. Marvin and MacPherson) *Smithson. Contrib. Earth Sci.* 28, 93-98. Washington, DC.

Gooding J.L. (1990) Scientific guidelines for preservation of samples collected from Mars. *NASA Tech. Memo.* 418. Johnson Space Center, Houston.

Gooding J.L. (1992a) Aqueous geochemistry on Mars: Possible clues from salts and clays in SNC meteorites (abs). In *MSATT workshop on chemical weathering on Mars*. (eds. Burns and Banin) *LPI Tech. Rpt.* 92-04, 16-17. Lunar Planetary Institute, Houston.

Gooding J.L. (1992b) Soil mineralogy and chemistry on Mars: Possible clues from salts and clays in SNC meteorites. *Icarus* 99, 28-41.  
EETA79001 ALHA77005 Shergotty Nakhla Chassigny

Gooding J.L. and Muenow D.W. (1986) Martian volatiles in shergottite EETA79001: New evidence from oxidized sulfur and sulfur-rich alumino-silicates. *Geochim. Cosmochim. Acta* 50, 1049-1059.  
EETA79001

Gooding J.L., Aggrey K. and Muenow D.W. (1987a) Pre-terrestrial volatile compounds in shergottites and nakhlites (abs). *Meteoritics* 22, 391.  
ALHA77005 EETA79001 Nakhla Shergotty

Gooding J.L., Wentworth S.J. and Zolensky M.E. (1987b) Martian (?) calcite and gypsum in shergottite EETA79001 (abs). *Lunar Planet. Sci.* XVIII, 345-346. Lunar Planetary Institute, Houston.  
EETA79001

Gooding J.L., Wentworth S.J. and Zolensky M.E. (1988) Calcium carbonate and sulfate of possible extraterrestrial origin in the EETA79001 meteorite. *Geochim. Cosmochim. Acta* 52, 909-915.  
EETA79001

Gooding J.L., Carr M.H. and McKay C.P. (1989) The case for planetary sample return missions. 2. History of Mars. *EOS* 70, 745.

Gooding J.L., Aggrey K.E. and Muenow D.W. (1990a) Volatile compounds in shergottite and nakhlite meteorites. *Meteoritics* 25, 281-289.  
EETA79001 Nakhla ALHA77005 Shergotty

Gooding J.L., Aggrey K.E. and Muenow D.W. (1990b) Volatile compounds in shergottite and nakhlite meteorites (abs). *Lunar Planet. Sci.* XXI, 423-424. Lunar Planetary Institute, Houston.

Gooding J.L., Wentworth S.J. and Zolensky M.E. (1991) Aqueous alteration of the Nakhla meteorite. *Meteoritics* 26, 135-143.

Nakhla

Gooding J.L. and Wentworth S.J. (1991) Origin of “white druse” salts in the EETA79001 meteorite (abs). *Lunar Planet. Sci.* XXII, 461-462. Lunar Planetary Institute, Houston.  
EETA79001

Gooding J.L., Arvidson R.E. and Zolotov M.Yu. (1992) Physical and chemical weathering. In *Mars* (eds. Kieffer *et al.*), pp. 626-651, Univ. Arizona Press, Tucson.

Gooding J.L. and Wentworth S.J. (1996) Origin of “white druse” in the EETA79001 meteorite. Curator’s note. JSC Curator’s Office, Houston.  
EETA79001

Goodrich C.A. (2001) Chromites in basaltic shergottite Sayh al Uhaymir 005: Implications for petrogenesis and relationship to Lherzolithic shergottites (abs#1166). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
SaU005

Goodrich C.A. (2002) Olivine-phyric Martian basalts: A new type of shergottite. *Meteoritics & Planet. Sci.* 37, B31-B34.

Goodrich C.A. and Zipfel J. (2001a) Magmatic inclusions in olivine and chromite in basaltic shergottite Sayh al Uhaymir 005: Implications for petrogenesis (abs#1174). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
SaU005

Goodrich C.A. and Zipfel J. (2001b) The parent magma of the megacryst assemblage in Shergottite EETA79001 (Lithology A) inferred from melt inclusions in olivine and chromite (abs). *Meteoritics & Planet. Sci.* 36, A69.  
EETA79001

Goodrich C.A. and Harvey R.P. (2002) The parent magmas of lherzolitic shergottites ALH77005 and LEW88516: A reevaluation from magmatic inclusions in olivine and chromite (abs). *Meteoritics & Planet. Sci.* 37, A54.  
ALH77005 LEW88516

Goodrich C.A. (2002) Petrogenesis of olivine-phyric shergottites Sayh al Uhaymir 005 and Elephant Moraine A79001 lithology A (abs). Un-mixing SNCs. 17-18. LPI Contribution No. 1134.  
EETA79001 SaU005

Goodrich C.A., Herd C.D.K. and Taylor L.A. (2003a) Spinel and oxygen fugacity in olivine-phyric and lherzolitic shergottites (abs#1426). *Lunar Planet. Sci.* XXXIV Lunar Planetary Institute, Houston

Goodrich C.A., vanNiekerk D. and Morgan M.L. (2003b) Northwest Africa 1110: A new olivine-phyric shergottite possibly paired with Northwest Africa 1068 (abs#1266). *Lunar Planet. Sci.* XXXIV Lunar Planetary Institute, Houston  
NWA1110

Goodrich C.A., Herd C.D.K. and Taylor L.A. (2003c) Spinel and oxygen fugacity in olivine-phyric and lherzolitic shergottites. *Meteoritics & Planet. Sci.* 38, 1773-1792.

Goreva J.S., Guan Y. and Leshin L.A. (2002) Isotopic composition of carbon in Martian magmatic minerals: Insights into Martian carbon reservoirs (abs#1933). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)  
Los Angeles

Goreva J.S., Leshin L.A. and Guan Y. (2003) Ion microprobe measurements of carbon isotopes in Martian phosphates: Insights into the Martian mantle (abs #1987). *Lunar Planet. Sci. Conf.* 34<sup>th</sup> Lunar Planetary Institute, Houston (CD-ROM).

Goswami J.N., Sinha N., Murty S.V.S., Mohapatra R.K. and Clement C.J. (1997) Nuclear tracks and light noble gases in Allan Hills 84001: Pre-atmospheric size, fall characteristics, cosmic-ray exposure duration and formation age. *Meteoritics & Planet. Sci.* 32, 91-96.  
ALH84001 ALHA77005 EETA79001 Shergotty

Grady M.M. (2000) *Catalogue of Meteorites. Fifth edition.* Cambridge Univ. Press. (see also catalogs by Graham et al. 1985 and Hey 1966)

Grady M.M., Gibson E.K., Wright I.P. and Pillinger C.T. (1989) The formation of weathering products on the LEW85320 ordinary chondrite: Evidence from carbon and oxygen stable isotope compositions and implications for carbonates in SNC meteorites. *Meteoritics* 24, 1-7.

Grady M.M., Wright I.P., Franchi I.A. and Pillinger C.T. (1993) Nitrates in SNCs: Implications for the nitrogen cycle on Mars (abs). *Lunar Planet. Sci.* XXIV, 553-554. Lunar Planetary Institute, Houston  
EETA79001

Grady M.M., Wright I.P., Douglas C. and Pillinger C.T. (1994a) Carbon and nitrogen in ALH84001 (abs). *Meteoritics* 29, 469.  
ALH84001

Grady M.M., Wright I.P. and Pillinger C. . (1994b) A search for nitrates in Nakhla (abs). *Lunar Planet. Sci.* XXV, 451-452. Lunar Planetary Institute, Houston  
Nakhla

Grady M.M., Wright I.P. and Pillinger C.T. (1995a) A search for nitrates in Martian meteorites. *J. Geophys. Res.* 100, 5449-5455.  
EETA79001 Nakhla

Grady M.M., Wright I.P., Douglas C. and Pillinger C.T. (1995b) Carbonates in Martian meteorites: A reappraisal (abs). *Meteoritics* 30, 511-512.  
Nakhla

Grady M.M. and Hutchison R. (1996) The meteorite teaching package of the Natural History Museum (abs). *Lunar Planet. Sci.* XXVII, 435-436. Lunar Planetary Institute, Houston  
Nakhla

Grady M.M., Wright I.P. and Pillinger C.T. (1996a) Nitrogen and Argon in ALH84001 revisited: Unraveling a Martian atmospheric component (abs). *Lunar Planet. Sci.* XXVII, 437-438. Lunar Planetary Institute, Houston  
ALH84001

Grady M.M., Verchovsky A., Wright I.P. and Pillinger C.T. (1996b) Fully automated stepped combustion analysis of carbon, nitrogen and argon in QUE94201: Comparison with other shergottites (abs). *Meteoritics & Planet. Sci.* 31, A52-A53.  
QUE94201

Grady M.M., Wright I.P. and Pillinger C.T. (1996c) Opening a Martian can of worms? *Nature* 382, 575-576.  
ALH84001

Grady M.M., Verchovsky A.B., Wright I.P. and Pillinger C.T. (1997a) The light element geochemistry of Yamato 793605 (abs). *Meteoritics & Planet. Sci.* 32, A51.  
Y793605

Grady M.M., Verchovsky A.B., Wright I.P. and Pillinger C.T. (1997b) Carbon, nitrogen and neon in Yamato 793605 lherzolite shergottite (abs). *NIPR Sym. Antarctic Meteorites* 22nd, 46-48. Nat. Inst. Polar Res., Tokyo.  
Y793605

Grady M.M., Wright I.P. and Pillinger C.T. (1997c) A carbon and nitrogen isotope study of Zagami. *J. Geophys. Res.* 102, 9165-9173.  
Zagami

Grady M.M., Verchovsky A.B., Wright I.P. and Pillinger C.T. (1997d) Light element geochemistry of Yamato-793605. *Antarctic Meteorite Res.* 10, 151-162. Nat. Inst. Polar Res., Tokyo.  
Y793605

Grady M.M., Wright I.P. and Pillinger C.T. (1998) A nitrogen and argon stable isotope study of Allan Hills 84001: Implications for the evolution of the Martian atmosphere. *Meteoritics & Planet. Sci.* 33, 795-802.  
ALH84001

Grady M.M and Wright I.P (2003) Carbon reservoirs on Mars: Constraints from Martian meteorites (abs#1312). *Lunar Planet. Sci.* XXXIV Lunar Planetary Institute, Houston

Grady M.M., Anand M., Bridges J.C., Pearson V.K., Franchi I.A. and Wright I.P. (2005) Aqueous alteration of nakhrites: Implications for water on Mars (abs). *Meteoritics & Planet. Sci.* 40, A59.  
MIL03346

Grady M.M., Anand M., Gilmour M.A., Watson J. and Wright I.P. (2007) Continuing investigation of the nakhlite magma pile. *Meteoritics & Planet. Sci.* 42, A59.  
MIL03346 Nakhla Governador Valadares Lafayette Y000593 Chassigny

Graham A.L., Bevan A.W.R. and Hutchison R. (1985) *Catalogue of Meteorites. Fourth Edition.* British Museum (Natural History). Univ. Arizona Press, Tucson.  
Nakhla Lafayette Governador Valadares Chassigny Shergotty Zagami

Graham G.A., Kearsley A.T., Wright I.P., Grady M.M. and Pillinger C.T. (2000) Carbonates in Los Angeles 001 meteorite (abs). *Meteoritics & Planet. Sci.* 35, A63.  
Los Angeles

Greenwood J.P. (2005) Chlorine-rich apatites in SNC's: Evidence for Magma-brine interactions on Mars? (abs) *Meteoritics & Planet. Sci.* 40, A60.

Greenwood J.P., Riciputi L.R. and McSween H.Y. (1997a) Sulfur isotopic variations in sulfides from shergottites and ALH84001 determined by ion microprobe: No evidence for life on Mars (abs). *Lunar Planet. Sci.* XXVIII, 459-460. Lunar Planetary Institute, Houston  
ALH84001

Greenwood J.P., Riciputi L.R. and McSween H.Y. (1997b) Sulfide isotopic compositions in shergottites and ALH84001 and possible implications for life on Mars. *Geochim. Cosmochim. Acta* 61, 4449-4453.  
Shergotty Zagami QUE94201 EETA79001 LEW88516, ALH84001

Greenwood J.P. and McSween H.Y. (1998) Origin of stoichiometric feldspathic glasses in ALH84001 by

mixing of plagioclase and orthoclase during multiple shock events (abs#1830). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Greenwood J.P., Riciputi L.R. and McSween H.Y. (1998a) Sulfur isotopic ratios in Nakhla and Chassigny sulfides determined by ion microprobe: Implications for the Martian sulfur cycle (abs#1643). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
Nakhla Chassigny

Greenwood J.P., Riciputi L.R., Taylor L.A. and McSween H.Y. (1998b) Hydrothermal modification of sulfides in Nakhla, Lafayette and Chassigny (abs). *Meteoritics & Planet. Sci.* 33, A62-63.  
Nakhla Lafayette Chassigny.

Greenwood J.P., Mojzsis S.J., Coath C.D. and Wasson J.T. (1999) Measurements of Sulfur-32,33,34 in Allan Hills 84001 and Nakhla sulfides by multicollector secondary ion mass spectrometry: Implications for Crustal-Atmospheric exchange and biogenic activity on Mars. *Ninth Annual V. M. Goldschmidt Conference*, 103, Cambridge  
ALH84001 Nakhla

Greenwood J.P., Warren P.H. and Rubin A. E. (2000a) Late-stage crystallization of Los Angeles, A new basaltic shergottite (abs#2074). *Lunar Planet. Sci.* XXXI Lunar Planetary Institute, Houston (CD-ROM).  
Los Angeles

Greenwood J.P., Riciputi L.R., McSween H.Y. and Taylor L.A. (2000b) Modified sulfur isotopic compositions of sulfides in the nakhrites and Chassigny. *Geochim. Cosmochim. Acta* 64, 1121-1131.  
Nakhla Governador Valadares Lafayette Chassigny

Greenwood J.P., Mojzsis S.J. and Coath C.D. (2000c) Sulfur isotopic compositions of individual sulfides in Martian meteorites ALH84001 and Nakhla: implications for crust-regolith exchange on Mars. *Earth Planet. Sci. Lett.* 184, 23-35.  
ALH84001, Nakhla

Greenwood J.P. and McSween H.Y. (2001) Petrogenesis of Allan Hills 84001: Constraints from impact-melted feldspathic and silica glasses. *Meteoritics & Planet. Sci.* 36, 43-61  
ALH84001.

Greenwood J.P., Mojzsis S.J. and Coath C.D. (2001) Development of the sulfur isotope biomarker for Mars sample return: Results from Los Angeles, Nakhla and ALH84001 (abs#1734). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
Los Angeles Nakhla ALH84001

Greenwood J.P. and Blake R.E. (2001) Oxygen isotope ratios of phosphate in ALH84001 and Los Angeles by ion microporbe : Development of a new biomarker in the search for life on Mars (abs). *Meteoritics & Planet. Sci.* 36, A72.  
ALH84001 Los Angeles

Greenwood J.P. and McKeegan K.D. (2002) Oxygen isotope composition of silica in ALH84001 (abs). *Meteoritics & Planet. Sci.* 37, A54.  
ALH84001

Greenwood J.P., Blake R.E. and Coath C.D. (2003) Ion microprobe measurements of  $^{18}\text{O}/^{16}\text{O}$  ratios of phosphate minerals in the Martian meteorites ALH84001 and Los Angeles. *Geochim. Cosmochim. Acta* 67, 2289-2298.  
ALH84001 Los Angeles

- Greenwood J.P., Itoh S., Sakamoto N., Vicenzi E.P. and Yurimoto H. (2007) Hydrogen isotopigraphy of apatite in Los Angeles, Shergotty and ALH84001: New constraints on Martian water history and SNC petrogenesis (abs#2134). *Lunar Planet. Sci.* XXXVIII Lunar Planet. Inst., Houston (CD-ROM) ALH84001 Los Angeles Shergotty
- Green P.F., Bull R.K. and Durrani S.A. (1978) The fission track records of the Esterville, Nakhla and Odessa meteorites. *Geochim. Cosmochim. Acta* 42, 1359-1366.  
Nakhla
- Greshake A. (1998) Transmission electron microscopy characterization of shock defects in minerals from the Nakhla SNC meteorite (abs). *Meteoritics & Planet. Sci.* 33, A63.  
Nakhla
- Greshake A. and Langenhorst F. (1997) Transmission electron microscope characterization of shock defects in minerals of the Martian meteorite Chassigny (abs). *Meteoritics & Planet. Sci.* 32, A52.  
Chassigny
- Greshake A., Stephen T. and Rost D. (1998) Symplectic exsolutions in olivine from the Martian meteorite Chassigny: Evidence for slow cooling under highly oxidizing conditions (abs#1069). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
Chassigny
- Greshake A. and Stöffler D. (1999) Shock metamorphic features in the SNC meteorite Dar al Gani 476 (abs#1377). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM).  
DaG476
- Greshake A. and Stöffler D. (2000) Shock related melting phenomena in the SNC meteorite Dar al Gani 476 (abs#1043). *Lunar Planet. Sci.* XXXI Lunar Planetary Institute, Houston (CD-ROM).  
DaG476
- Greshake A., Stephan T. and Rost D. (2000) Combined TEM and TOF-SIMS study of symplectite exsolutions in olivine from the Martian meteorites Nakhla and Governador Valadarez (abs#1150). *Lunar Planet. Sci.* XXXI Lunar Planetary Institute, Houston (CD-ROM).  
Nakhla Governador Valadarez
- Greshake A., Fritz J. and Stöffler D. (2003) Petrography and shock metamorphism of the unique shergottite Yamato 980459 (abs). International Symposium. *Evolution of Solar System: A New Perspective from Antarctic Meteorites*, 29-30. Nat. Inst. Polar Res., Tokyo.  
Y980459
- Greshake A., Fritz J. and Stöffler D. (2004) Petrology and shock metamorphism of the olivine-phyric shergottite Yamato 980459: Evidence for a two-stage cooling and single-stage ejection history. *Geochim. Cosmochim. Acta* 68, 2359-2377.  
Y980459
- Greshake A. and Fritz J. (2009) Discovery of ringwoodite, wadsleyite and gama Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> in Chassigny: Constraints on shock conditions (abs#1586). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.  
Chassigny
- Griffith L.L. and Shock E.L. (1995) A geochemical model for the formation of hydrothermal carbonates on Mars. *Nature* 377, 406-408.  
Shergotty ALH84001

- Griffith L.L., Shock E.L. and Arvidson R.E. (1995) Calculating the effects of hydrothermal alteration on Mars (abs). *Lunar Planet. Sci.* XXVI, 517-518. Lunar Planetary Institute, Houston
- Griffith L.L. and Shock E.L. (1997a) Orthopyroxenite hydrothermal alteration pathways: Low vs. high temperature (abs). *Lunar Planet. Sci.* XXVIII, 469-470. Lunar Planetary Institute, Houston  
ALH84001
- Griffith L.L. and Shock E.L. (1997b) Hydrothermal hydration of Martian crust: Illustration via geochemical model calculations. *J. Geophys. Res.* 102, 9135-9143.  
Shergotty Chassigny
- Griffith L.L. and Shock E.L. (1998) New models of planetary processes that link magma evolution and hydrothermal alteration (abs#1971). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).
- Grimm R.E. and McSween H.Y. (1982) Numerical simulation of crystal fractionation in shergottite meteorites. *Proc. Lunar Planet. Sci. Conf.* 13th; *J. Geophys. Res.* 87 (suppl.), A385-A392.  
Shergotty Zagami
- Grimm R.E., McSween H.Y. and Callcott T.A. (1982) Numerical simulation of crystal fractionation in shergottites (abs). *Lunar Planet. Sci.* XIII, 287-288. Lunar Planetary Institute, Houston
- Grossman J.N. (1994) The Meteoritical Bulletin, No. 76: The U. S. Antarctic meteorite collection. *Meteoritics* 29, 100-143.  
ALHA77005 EETA79001 ALH84001 LEW88516
- Grossman J.N. and Score R. (1996) Recently classified specimens in the US Antarctic meteorite collection (1994-1996). *Meteoritics & Planet. Sci.* 31, A161-A180.  
QUE94201
- Grossman J.N. (1998) The Meteoritical Bulletin, No. 83, 1999 July. *Meteoritics & Planet. Sci.* 34, A169-186.  
DaG476, DaG489
- Grossman J.N. (2000) The Meteoritical Bulletin, No. 84, 2000 August. *Meteoritics & Planet. Sci.* 35, A199-225.  
DaG670 Dho019 Los Angeles SaU005 SaU008
- Grossman J.N. and Zipfel J. (2001) The Meteoritical Bulletin, No. 85, 2001 September. *Meteoritics & Planet. Sci.* 36, A293-A322.  
DaG876 NWA480 NWA817 SaU051 SaU094
- Guan Y., Hsu W., Leshin L.A., Wang H., Wang R., Zhang F., Lin C. and Zhang W. (2003) Hydrogen isotopes of phosphates in the new Martian meteorite GRV99027 (abs#1830). *Lunar Planet. Sci.* XXXIV Lunar Planetary Institute, Houston  
GRV99027
- Gulick V.C., ed. (1997) Mars 2005 sample return workshop. *LPI Tech. Rpt.* 97-01. Lunar and Planetary Institute, Houston.
- Haag R. (1991) *Field guide of meteorites. 10th Anniversary Edition.* R. Haag, 60 pp, Tucson.  
Zagami Nakhla
- Hale V.P.S., McSween H.Y. and McKay G.A. (1997) Estimates of cumulus pyroxene and intercumulus liquid compositions in Shergotty (abs). *Meteoritics & Planet. Sci.* 32, A54.

Shergotty Zagami

Hale V.P.S., McSween H.Y. and McKay G.A. (1998) Cumulus pyroxene in Shergotty: Why do estimates vary between experimental and observational studies? (abs#1109) *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).

Shergotty

Hale V.P.S., McSween H.Y. and McKay G.A. (1999) Re-evaluation of intercumulus liquid composition and oxidation state for the Shergotty meteorite. *Geochim. Cosmochim. Acta* 63, 1459-1470.

Shergotty Zagami

Hall T.M. and Burns R.G. (1992) Fusion crusts of achondrites: Changes of mineralogy of iron in the outermost surfaces of meteorites (abs). *Lunar Planet. Sci.* XXIII, 475-476. Lunar Planetary Institute, Houston  
Nakhla EETA79001 ALHA77005

Halliday A.N. and Lee D.-C. (1999) Tungsten isotopes and the early development of the Earth and of the Moon. *Geochim. Cosmochim. Acta* 63, 4157-4179.

Halliday A.N., Wänke H., Birk J-L. and Clayton R.N. (2001) The accretion, composition and early differentiation of Mars. *Space Science Rev.* 96, 197-230. The Netherlands

Hamilton V.E. (2005) A source region for Martian meteorite ALH84001: Eos Chasma, Mars (abs#5128). *Meteoritics & Planet. Sci.* 40, A63.

Hamilton V.E. and Christensen P.R. (1996) Determining the composition of Mars: Vibrational spectroscopy of the Zagami meteorite (abs). *Lunar Planet. Sci.* XXVII, 481-482. Lunar Planetary Institute, Houston  
Zagami

Hamilton V.E. and Christensen P.R. (1997) Interpreting the origins and evolutions of Martian basalts from pyroxene composition, II, Vibrational spectroscopy of clinopyroxenes and terrestrial basaltic rocks (abs). *Lunar Planet. Sci.* XXVIII, 499-500. Lunar Planetary Institute, Houston

Hamilton V.E., Christensen P.R. and McSween H.Y. (1997a) Determining the compositions of Martain meteorites using thermal infrared emission spectroscopy: A precursor to Martian surface spectroscopy (abs). *Meteoritics & Planet. Sci.* 32, A55.  
ALH77005 Nakhla Lafayette Zagami EET79001

Hamilton V.E., Christensen P.R. and McSween H.Y. (1997b) Determination of Martian meteorite lithologies and mineralogies using vibrational spectroscopy. *J. Geophys. Res.* 102, 25593-25603.  
ALHA77005 Nakhla Zagami EETA79001

Hamilton V.E., Christensen P.R., McSween H.Y. Jr., Clark R.N. and Hoefen T.M. (2001a) Spectral variations in MGS TES data of Nili Fossae: A possible source region for SNC meteorites on Mars? (abs#2184). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)

Hamilton V.E., McSween H.Y. and Christensen P.R. (2001b) Searching for Martian meteorite source regions using Mars Global Surveyor Thermal Emission Spectrometer data (abs). *Meteoritics & Planet. Sci.* 36, A75.

Hamilton V.E., Christensen P.R. and McSween H.Y. (2002) Global constraints on the source regions of Martian meteorites from MGS TES data (abs). *Meteoritics & Planet. Sci.* 37, A59.

Hamilton V.E. and Christensen P.R. (2003a) Detailed mineralogical analysis of Martian meteorite-like

terrains using MGS TES and Odyssey THEMIS data (abs#1982). *Lunar Planet. Sci. Conf.* 34<sup>th</sup>, Lunar Planetary Institute, Houston (CD-ROM).

Hamilton V.E. and Christensen P.R. (2003b) High spectral & spatial resolution analysis of Martian meteorite-like compositions on the surface of Mars (abs). 66<sup>th</sup> Meteoritical Society Meeting, Munster.

Hammer J.E. abd Rutherford M.J. (2005) Experimental crystallization of fe-rich basalt: Application to cooling rate and oxygen fugacity of Nakhelite MIL03346 (abs#1999). *Lunar Planet. Sci.* XXXVI CD-ROM, Lunar Planet. Institute, Houston.

Haramura H. (1995) Chemical compositions of Antarctic meteorites. In *Catalog of the Antarctic Meteorites*. (eds. Yanai and Kojima) page 48. Nat. Inst. Polar Res., Tokyo.  
ALHA77005 Zagami

Hartmann W.K. (2002a) Mars cratering chronology system: Improved isochrons and dates (abs). Meteoritics 65<sup>th</sup> meeting at UCLA. *Meteoritics & Planet. Sci.*

Hartmann W.K. (2002b) Mars meteorite statistics and the Martian uplands (abs). Un-mixing SNCs. 19. LPI Contribution No. 1134. Lunar Planetary Institute, Houston (CD-ROM).

Hartmann W.K., Popova O. and Nemtchinov I. (2003) SNC's that didn't make it: Analysis of impact crater clusters on Mars (abs#1815). *Lunar Planet. Sci.* XXXIV Lunar Planetary Institute, Houston (CD-ROM).

Hartmetz C.P., Wright I.P. and Pillinger C.T. (1991) Attempts to constrain the carbon isotopic composition of dispersed carbonate in EETA79001 (abs). *Meteoritics* 26, 342.  
EETA79001

Harper C.L. and Jacobsen S.B. (1994) Accretion chronology of the inner solar system: Isotopic constraints (abs). *Meteoritics* 29, 471.

Harper C.L., Nyquist L.E., Bansal B., Weismann H. and Shih C.-Y. (1995) Rapid accretion and early differentiation of Mars indicated by  $^{142}\text{Nd}/^{144}\text{Nd}$  in SNC meteorites. *Science* 267, 213-217.  
Nakhla Lafayette Chassigny Governador Valadares Shergotty Zagami ALHA77005  
EETA79001

Harvey R.P. (1998) Formation of carbonates in Allan Hills 84001 by impact metasomatism: Cooking with gas. (abs) *Workshop on the Issue Martian Meteorites: Where - - - #7019*. Lunar Planetary Institute, Houston.

Harvey R.P. (2001) The Ferrar Dolerite: An Antarctic analog for Martian basaltic lithologies and weathering processes (abs#4012). Workshop on Martian Highlands. Lunar Planetary Institute, Houston.

Harvey R.P. and McSween H.Y. (1991a) New observations of Nakhla, Governador Valadares and Lafayette, and their bearing on petrogenesis (abs). *Lunar Planet. Sci.* XXII, 527-528. Lunar Planetary Institute, Houston  
Nakhla Governador Valadares Lafayette

Harvey R.P. and McSween H.Y. (1991b) Parental magmas of the nakhlites: Clues from the mineralogy of magmatic inclusions (abs). *Meteoritics* 26, 343.  
Governador Valadares

Harvey R.P. and McSween H.Y. (1992a) The mineralogy and petrography of LEW88516 (abs). *Meteoritics* 27, 231-232.

LEW88516

Harvey R.P. and McSween H.Y. (1992b) Petrogenesis of the nakhelite meteorites: Evidence from cumulate mineral zoning. *Geochim. Cosmochim. Acta* 56, 1655-1663.  
Nakhla Lafayette Governador Valadares

Harvey R.P. and McSween H.Y. (1992c) Parental magmas of the nakhellites re-examined (abs). *Lunar Planet. Sci.* XXIII, 499-500. Lunar Planetary Institute, Houston  
Governador Valadares

Harvey R.P. and McSween H.Y. (1992d) Parent magma of the nakhelite meteorites: Clues from melt inclusions. *Earth Planet. Sci. Lett.* 111, 467-482.  
Nakhla Governador Valadares

Harvey R.P., Wadhwa M., McSween H.Y. and Crozaz G. (1993) Petrography, mineral chemistry and petrogenesis of Antarctic shergottite LEW88516. *Geochim. Cosmochim. Acta* 57, 4769-4783.  
LEW88516

Harvey R.P. and McSween H.Y. (1994) Ancestor's bones and palimpsests: Olivine in ALH84001 and orthopyroxene in Chassigny (abs). *Meteoritics* 29, 472.  
ALH84001 Chassigny

Harvey R.P. and McSween H.Y. (1995) Carbonates in the Martian orthopyroxenite ALH84001: Evidence of formation during impact-driven metasomatism (abs). *Lunar Planet. Sci.* XXVI, 555-556. Lunar Planetary Institute, Houston  
ALH84001

Harvey R.P. and McSween H.Y. (1996) A possible high-temperature origin for the carbonates in Martian meteorite ALH84001. *Nature* 382, 49-51.  
ALH84001

Harvey R.P., McCoy T.J. and Leshin L.A. (1996) Shergottite QUE94201: Texture, mineral compositions, and comparison with other basaltic shergottites (abs). *Lunar Planet. Sci.* XXVII, 497-498. Lunar Planetary Institute, Houston  
QUE94201

Harvey R.P. and Hamilton V.E. (2005) Syrtis Major as the source region of the nakhelite/Chassigny Martian meteorites (abs#5165). *Meteoritics & Planet. Sci.* 40, A65,

Harvey R.P. and Hamilton V.E. (2005) Syrtis Major as the source of the nakhelite/Chassigny group of Martian meteorites: Implications for the geological history of Mars (abs). *Lunar Planet. Sci.* XXXVI Lunar Planetary Institute, Houston

Hargraves R.B., Collinson E.W., Arvidson R.E. and Spitzer C.R. (1977) Viking results. *J. Geophys. Res.* 82, 4547-4558.

Hasan F.A. and Sears D.W.G. (1985) A thermoluminescence study of the shergottites (abs). *Lunar Planet. Sci.* XVI, Suppl. A, 1314. Lunar Planetary Institute, Houston  
Shergotty EETA79001 Zagami ALHA77005

Hasan F.A., Haq M. and Sears D.W.G. (1986) Thermoluminescence and the reheating history of meteorites- III: The shergottites. *Geochim. Cosmochim. Acta* 50, 1031-1038.  
Shergotty EETA79001 Zagami ALHA77005

Hasan F.A., Score R., Myers B.M., Sears H., Cassidy W.A. and Sears D.W.G. (1992) Natural

thermoluminescence levels and the recovery location of Antarctic meteorites. In *Field and laboratory investigations of Antarctic Meteorites collected by United States Expeditions, 1985-1987.* (eds. Marvin and MacPherson). *Smithsonian Contr. Earth Sci.* 30, 57-68.

Hashimoto M., McKay G., Le L., Schwandt C. and Mikouchi T. (1999) Experimental crystallization of a revised Shergotty bulk composition (abs). *Meteoritics & Planet. Sci.* 34, A51.

Haskin L., Frey F., Schmitt R.A. and Smith R.H. (1966) Meteorites, solar and terrestrial rare earth distributions. *Phys. Chem. Earth* 7, 167-321.  
Nakhla Lafayette

Head J.N. (1999) Fragmentation and ejection of the Martian clan meteorites. Ph. D. Thesis, Univ. of Arizona, Tucson.

Head J.N. and Melosh H.J. (2000) Launch velocity distribution of the Martian clan meteorites (abs#1937). *Lunar Planet. Sci. XXXI* Lunar Planetary Institute, Houston (CD-ROM).

Head J.N., Melosh H.J. and Ivanov B.A. (2002) Martian meteorite launch: High-speed ejecta from small craters. *Science* 298, 1752-1756.

Herd C.D.K. (2002) Martian basalt oxygen fugacity and geochemistry: Implications for a heterogeneous Martina mantle (abs). Un-mixing SNCs. 21-22. LPI Contribution No. 1134. Lunar Planetary Institute, Houston (CD-ROM).

Herd C.D.K. (2003) The oxygen fugacity of olivine-pyric Martian basalts and the components within the mantle and crust of Mars. *Meteoritics & Planet. Sci.* 38, 1793-1806.

Herd C.D.K. (2006a) Fractionation of K, U and Th during Martian alteration: Insights from MIL03346 (abs#2079). *Lunar Planet. Sci. Conf. XXXVII* Lunar Planetary Institute, Houston. (CD-ROM)  
MIL03346

Herd C.D.K. (2006b) Insights into the redox history of the NWA 1068/1110 martian basalt from mineral equilibria and vanadium oxybarometry. *Amer. Mineral.* 91, 1616-1627.  
NWA1068 NWA1110

Herd C.D.K. and Papike J.J. (1998) Estimates of oxygen fugacity in the basaltic shergottites from electron microprobe oxygen analysis (abs#7019). *Workshop on the Issue Martian Meteorites: Where* Lunar Planetary Institute, Houston.

Herd C.D.K. and Papike J.J. (1999) Implications for the petrogenesis of Martian meteorite Dar al Gani 476 from spinel, olivine and pyroxene compositions (abs). P-62, GSA, Denver.  
DaG476

Herd C.D.K., Jones J.H. and Papike J.J. (2000a) Experimental constraints on the Cr content, oxygen fugacity and petrogenesis of EETA79001 lithology A (abs#1387). *Lunar Planet. Sci. XXXI* Lunar Planetary Institute, Houston (CD-ROM).  
EETA79001

Herd C.D.K., Shearer C.K. and Papike J.J. (2000b) Systematics of Ni and Co in olivine from planetary melt systems: Martian basalts Dar al Gani 476 and EETA79001 (abs). *Lunar Planet. Sci. XXXI*, #1390. Lunar Planetary Institute, Houston (CD-ROM).  
DaG476 EETA79001

Herd C.D.K. and Papike J.J. (2000c) Oxygen fugacity of the Martian basalts from analysis of iron-titanium oxides: Implications for Mantle-crust interaction on Mars (abs). *Meteoritics & Planet. Sci.*

35, A70.

QUE94201 DaG476 EETA79001 Shergotty Zagami Los Angles

Herd C.D.K., Jones J.H., Schearer C.K. and Papike J.J. (2001a) Systematics of Ni, Co, Cr and V in olivine from planetary melt systems: Martian basalts (abs#1635). *Lunar Planet. Sci. XXXII* Lunar Planetary Institute, Houston. (CD-ROM)

DaG476 EETA79001 ALH77005 LEW88516

Herd C.D.K., Borg L.E. and Papike J.J. (2001b) Controls on oxygen fugacity during Martian basalt petrogenesis: Clues from geochemical correlations (abs#1150). *Lunar Planet. Sci. XXXII*, Lunar Planetary Institute, Houston. (CD-ROM)

Herd C.D.K., Karner J.M., Shearer C.K. and Papike J.J. (2001c) The effect of oxygen fugacity on Co and Ni partitioning in olivine: Insights into Martian magmas (abs). *Meteoritics & Planet. Sci.* 36, A78-79.

Dho019 DaG476 EETA79001 LEW88516 ALH77005

Herd C.D.K., Papike J.J. and Brearley A.J. (2001d) Oxygen fugacity of Martian basalts from electron microprobe oxygen and TEM-EELS analysis of Fe-Ti oxides. *Amer. Mineral.* 86, 1015-1024.

Shergotty Zagami EETA79001 DaG476 QUE94201 Los Angeles

Herd C.D.K., Borg L.E., Jones J.H. and Papike J.J. (2002a) Oxygen fugacity and geochemical variations in the Martian basalts: Implications for Martian basalt petrogenesis and the oxidation state of the upper mantle of Mars. *Geochim. Cosmochim. Acta* 66, 2025-2036.

Herd C.D.K., Treiman A.H., McKay G.A. and Shearer C.K. (2002b) Experimental lithium and boron partition coefficients: Implications for magmatic water in Martian meteoeites (abs#1333). *Lunar Planet. Sci. XXXIII* Lunar Planetary Institute, Houston. (CD-ROM)

Herd C.D.K., Treiman A.H., McKay G.A. and Shearer C.K. (2002c) Implications of experimental lithium and boron partition coefficients for the petrogenesis of Martian basalts (abs). *Meteoritics & Planet. Sci.* 37, A62.

Herd C.D.K., Schwandt C.S., Jones J.H. and Papike J.J. (2002d) An experimental and petrographic investigation of Elephant Moraine 79001lithology: Implications for its petrogenesis and the partitioning of chromium and vanadium in a Martian basalt. *Meteoritics & Planet. Sci.* 37, 987-1000.

EETA79001

Herd C.D.K., Treiman A.H., McKay G.A. and Shearer C.K. (2003) Light lithophile elements in natural and experimental phases in Martian basalts: Implications for the degassing of water from Martian magmas (abs#1635). *Lunar Planet. Sci. Conf.* 34<sup>th</sup>, Lunar Planetary Institute, Houston (CD-ROM).

Herd C.D.K., Treiman A.H., McKay G.A. and Shearer C.K. (2005) Light lithophile elements in Martian basalts: Evaluating the evidence for magmatic water degassing. *Geochim. Cosmochim. Acta* 69, 2431-2440.

Herd C.D.K., Simonetti A. and Peterson N.D. (2007) In Situ U-Pb geochronology of Martian baddeleyite by laser ablation MC-ICP-MS (abs#1664). *Lunar Planet. Sci. XXXVIII* Lunar Planetary Institute, Houston (CD-ROM).

Herd C.D.K. and Walton E.L. (2008) Cooling and crystalliation of the Miller range 03346 nakhelite: Insights from experimental petrology and mineral equilibria (abs#1496). *Lunar Planet. Sci. XXXIX*. Lunar Planet. Inst. Houston.

MIL03346

Herpers U., Vogt S., Bremer K., Hofmann H.J., Suter M., Wieler R., Lange H.-J. and Michel R. (1995)

Cosmogenic nuclides in differentiated Antarctic meteorites: measurements and model calculation.  
*Planet. Space Sci.* 43, 545-556.  
ALH84001

Hess P.C. (2002) Origin of the Martian crust and mantle (abs). Un-mixing SNCs. 23-24. LPI Contribution No. 1134.

Hey M.H. (1966) *Catalog of Meteorites*. British Museum (Natural History), London.  
Shergotty Nakhla Chassigny

Heymann D., Mazor E. and Anders E. (1968) Ages of the calcium-rich achondrites - I. Eucrites. *Geochim. Cosmochim. Acta* 32, 1241-1268.  
Shergotty Zagami

Hidaka H., Yoneda S. and Nishiizumi K. (2001) Neutron capture effects on Sm and Gd isotopes in Martian meteorites (abs). *Meteoritics & Planet. Sci.* 36, A680-81.  
ALH77005 ALH84001 EETA79001 Lafayette Nakhla SaU005 Zagami

Hiroi Taka, Miyamoto Masa, Mikouchi T. and Ueda Y. (2005) Visible and near-infrared reflectance spectroscopy of the Yamato 980459 meteorite in comparison with some shergottites. *Antarctic Meteorite Res.* 18, 83-95. Nat. Inst. Polar Res., Tokyo.

Hochleitner R., Tarcea N., Simon G., Kiefer W. and Popp J. (2004) Micro-Raman spectroscopy: A valuable tool for the investigation of extraterrestrial material. *J. Raman Spec.* 35, 515-518.  
ALH84001

Hofmann B.A., Gnos E., Hauser M., Moser L., Al-Kathiri A. and Franchi I.A. (2001) The 2001 Omani-Swiss meteorite search campaign and recovery of shergottite Sayh al Uhaymir 094 (abs). *Meteoritics & Planet. Sci.* 36, A82-83.  
SaU094

Hofmann B.A., Gnos E., Al-Kathiri A., Al-Azi H. and Al-Murazza A. (2003) Omani-Swiss meteorite search 2001-2003 project overview (abs). *Meteoritics & Planet. Sci.* 38, A54.

Hoffmann V. and Funaki M. (2006) Comparative magnetic signature of Martian meteoeites Yamato 000593, Yamato 000749, Yamato 000802, Yamato 980459, Yamato 79603 and ALH77005 (abs). *Antarctic Meteorites XXX*, 22-23. Nat. Inst. Polar Res., Tokyo  
Y000593 ALH77005

Hoffmann V., Torii M. and Funaki M. (2007) Yamato 000097 magnetic signature and comparison with other lherzolitic shergottite: preliminary results. *Antarctic Meteorites XXXI*, 26-27. Nat. Inst. Polar Res., Tokyo  
Y000097

Hoffmann V., Funaki M., Torii M. and Appel E. (2007) New perspectives from the nakhrites magnetic signature (abs). *Meteor. & Planet. Sci.* 42, A67.  
Y000593

Hoffmann V., Funaki M., Torii M., Kurihara T. and Mikouchi T. (2008) Magnetic signature of lherzolitic shergottites ALH77005 and Yamato 000097: "Brown" color olivines and detection of Fe metal particles by magnetotactic bacteria (abs#1703). *Lunar Planet. Sci. XXXIX*, Lunar Planetary Institute, Houston (CD-ROM).  
ALH77005 Y000097

Hoffmann V., Funaki M., Torii M., Hochleitner R. and Classen N. (2008) Systematic survey of the

magnetic signature of Martian meteorites (SNC): Extending the database (abs). *Meteor. & Planet. Sci.* 43, A59.

Hohenberg C.M. (1968) PhD Thesis, Univer. Calif., Berkeley.  
Lafayette

Holland G., Lyon I.C., Saxton J.M. and Turner G. (1999) Evidence for an unusual generation of carbonate in Allan Hills 84001. *Meteoritics & Planet. Sci.* 34, A55-56.  
ALH84001

Holland G., Lyon I.C., Cliff B., Lockyer N.P. and Vickerman J.C. (2000a) Halogen concentrations and distribution in Allan Hills 84001 measured by time-of-flight secondary ion mass spectroscopy (abs). *Meteoritics & Planet. Sci.* 35, A76.  
ALH84001

Holland G., Lyon I.C., Saxton J.M. and Turner G. (2000b) Very low oxygen-isotopic ratios in Allan Hills 84001 carbonates: possible meteoric component? (abs) *Meteoritics & Planet. Sci.* 35, A76-77.  
ALH84001

Holland G., Lyon I.C., Cliff B., Lockyer N.P. and Vickerman J.C. (2001a) Halogen concentrations and possible chlorine zoning in ALH84001 measured by time-of-flight SIMS and electron microprobe (abs#1654). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
ALH84001

Holland G., Lyon I.C., Saxton J.M. and Turner G. (2001b) Atmospheric precipitation as a possible origin of very light oxygen isotopes in ALH84001 carbonate (abs). *Meteoritics & Planet. Sci.* 36, A83-84.  
ALH84001

Hoover R.B. (1997) Meteoritic nanofossils and microfossils (abs). *7<sup>th</sup> Goldschmidt Conf. LPI Contribution* 921, 99. Tucson.  
ALH84001

Hörz F., Hanss R. and Serna C. (1986) X-ray investigations related to the shock history of the Shergotty achondrite. *Geochim. Cosmochim. Acta* 50, 905-908.  
Shergotty

Hsu W., Guan Y., Leshin L.A., Wang H., Wang R., Zhang F., Lin C. and Zhang F. (2003) REE microdistributions in the lherzolitic shergottite GRV99027(abs). *Meteoritics & Planet. Sci.* 38, A34.  
GRV99027

Hsu W., Guan Y., Wang H., Leshin L.A., Wang R., Zhang F., Chen X., Zhang F. and Lin C. (2004) The lherzolitic shergottite Grove Mountains 99027: Rare earth element geochemistry. *Meteoritics & Planet. Sci.* 39, 701-709.  
GRV99027

Hui Hejiu., Peslier A., Lapan T., Brandon A. and Schafer J. (2009) Northwest Africa 5298: A basaltic shergottite (abs#2087). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.  
NWA5298

Humayun M. and Clayton R.N. (1993) Potassium isotope cosmochemistry, volatile depletion and the origin of the Earth (abs). *Lunar Planet. Sci.* XXIV, 685-686. Lunar Planetary Institute, Houston  
Shergotty Zagami

Hume W.F. (1911) The first meteorite record in Egypt. *Cairo Sci. Journ.* vol V, no. 59, page 212.  
Nakhla

Hunten D.M., Pepin R.O. and Walker J.C.G. (1987) Mass fractionation in hydrodynamic escape. *Icarus* 69, 532-549.  
EETA79001

Hurowitz J.A., McLennan S.M., Lindsley D.H. and Schoonen M.A.A. (2005) Experimental epithermal alteration of synthetic Los Angeles meteorite: Implications for the origin of Martian soils and identification of hydrothermal sites on Mars. *J. Geophys. Res.* 110, E07002  
Los Angeles

Hutchins K.S. and Jakosky B.M. (1997) Carbonates in Martian meteorite ALH84001: A planetary perspective on the formation temperature. *Geophys. Res. Lett.* 24, 819-822.  
ALH84001

Hutchison R. (1981) The significance of unique or rare meteorites. *Nature* 293, 260.  
Nakhla

Hutchison R., Gale N.H. and Arden J.W. (1975) Invalid 4.01 Gyr. model U-Pb "age" of the Nakhla meteorite. *Nature* 254, 678-680.  
Nakhla

Ihinger P.D., Chamberlin S. and Smith S. (2002) Inorganic terrestrial analog for carbonate-magnetite-pyrite assemblage in ALH84001 (abs#2057). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)  
ALH84001

Ikeda Yukio (1994) Petrography and petrology of the ALHA77005 shergottite. *Proc. NIPR Symp. Antarctic Meteorites* 7th, 9-29. Nat. Inst. Polar Res., Tokyo.  
ALHA77005

Ikeda Y. (1997a) Petrology of the Yamato 793605 lherzolitic shergottite (abs). *Meteoritics & Planet. Sci.* 32, A64.  
Y793605

Ikeda Y. (1997b) Petrology and mineralogy of the Y-793605 Martian meteorite (abs). *NIPR Sym. Antarctic Meteorites* 22nd, 64-65. Nat. Inst. Polar Res., Tokyo.  
Y793605

Ikeda Y. (1997c) Petrology and mineralogy of the Y-793605 Martian meteorite. *Antarctic Meteorite Research* 10, 13-40. Nat. Inst. Polar Res., Tokyo.  
Y793605

Ikeda Y. (1998) Petrology of magmatic silicate inclusions in the Allan Hills 77005 lherzolitic shergottite. *Meteoritics & Planet. Sci.* 33, 803-812.  
ALH77005

Ikeda Y. (2001a) Magmatic inclusions in the DaG 735 shergottite (abs). *NIPR Sym. Antarctic Meteorites* 24th, 43. Nat. Inst. Polar Res., Tokyo.  
DaG735

Ikeda Y. (2001b) Magmatic and unusual inclusions in olivine grains in the Dar al Gani 735 shergottite (abs). *Meteoritics & Planet. Sci.* 36, A86.  
DaG735

Ikeda Y. (2003) Petrology of the Yamato 980459 shergottite (abs). International Symposium. *Evolution of*

*Solar System: A New Perspective from Antarctic Meteorites*, 42. Nat. Inst. Polar Res., Tokyo.  
Y980459

Ikeda Y. (2004) Petrology of the Yamato 980459 shergottite. *Antarct. Meteorite Res.* 17, 35-54. Nat. Inst. Polar Res., Tokyo.  
Y980459

Ikeda Y. (2005a) Magmatic inclusions in Martian meteorites. *Antarct. Meteorite Res.* 18, 170-187. Nat. Inst. Polar Res., Tokyo.

Ikeda Y. (2005b) Unusual inclusions within olivine megacrysts in the Dar al Gani 735 shergottite. *Antarct. Meteorite Res.* 18, 202-212. Nat. Inst. Polar Res., Tokyo.  
DaG735

Ikeda Y., Takeda H., Kimura M. and Suzuki A. (2002a) A new shergottite from Oman, Dhofar 378 (abs#1434). *Lunar Planet. Sci. XXXIII*. Lunar Planetary Institute, Houston. (CD-ROM)  
Dho378

Ikeda Y., Takeda H., Kimura M and Nakamura N. (2002b) A new basaltic shergottite, Dhofar 378 (abs). *Antarctic Meteorites XXVII*, 40-42. Nat. Inst. Polar Res., Tokyo  
Dho378

Ikeda Y. and Shimoda G. (2005) Major-element trend for shergottite melts and their source materials. *Antarct. Meteorite Res.* 18, 152-169. Nat. Inst. Polar Res., Tokyo.

Ikeda Y., Kimura M., Takeda Hiroshi, Shimoda G., Kita N.T., Morishita Y., Suzuki A., Jagoutz Emil and Dreibus G. (2006) Petrology of a new basaltic shergottite: Dhofar 378. *Antarctic Meteorite Res.* 19, 20-44. Nat. Inst. Polar Res., Tokyo.  
Dho378

Ikeda Y and Imae N. (2007) Magmatic inclusions in new lherzolitic shergottite, Y000027, Y000047 and Y000097 (abs). *Antarctic Meteorites XXXI*, 30-31. Nat. Inst. Polar Res., Tokyo  
Y000097

Ilg S., Jessberger E.K. and El Goresy A. (1997) Argon-40/Argon-39 laser extraction dating of individual maskelynites in SNC pyroxenite ALH84001 (abs). *Meteoritics & Planet. Sci.* 32, A65.  
ALH84001

Imae N., Okazaki R., Kojima H. and Nagao K. (2002a) The frst nakhelite from Antarctica (abs#1483). *Lunar Planet. Sci. XXXIII*. Lunar Planetary Institute, Houston. (CD-ROM)  
Y000593 Y000749

Imae N., Iwata N. and Shimoda Y. (2002b) Search for Antarctic meteorites in the bare ice field around the Yamato mountains by JARE-41. *Antarct. Meteorite Res.* 15, 1-24. Nat. Inst. Polar Res., Tokyo.

Imae N., Ikeda Y., Shinoda K., Kojima H. and Iwata N. (2002c) Two nakhellites from Antarctica: Y000593 and Y000749 (abs). *Antarctic Meteorites XXVII*, 45-47. Nat. Inst. Polar Res., Tokyo  
Y000593 Y000749

Imae N., Ikeda Y. and Kojima H. (2003a) Igneous petrogenesis of Yamato nakhellites (abs#1520). *Lunar Planet. Sci. XXXIV* Lunar Planetary Institute, Houston  
Y000593 Y000749 Y000802

Imae N., Ikeda Y., Shinoda K., Kojima H. and Iwata N. (2003b) Yamato nakhrites: Petrography and mineralogy. *Antarctic Meteorite Research* 16, 13-33. Nat. Inst. Polar Res., Tokyo.

Y000593 Y000749 Y000802

Imae N. and Ikeda Y. (2005) Comparative petrology of Yamato and MIL 03346 nakhrites (abs). *Meteoritics & Planet. Sci.* 40, A72.  
Y000593 MIL03346

Imae N., Ikeda Y. and Kojima H. (2005) Petrology of the Yamato nakhrites. *Meteoritics & Planet. Sci.* 40, 1581-1598.  
Y000593 Y000749 Y000802

Imae N. and Ikeda Y. (2006) Crystallization of nakhlite melts in comparison with synthetic experiments (abs). *Antarctic Meteorites XXX*, 35-36. Nat. Inst. Polar Res., Tokyo.

Imae N. and Ikeda Y. (2007) Petrology of the Miller Range 03346 nakhlite in comparison with the Yamato-000593 nakhelite. *Meteoritics & Planet. Sci.* 42, 171-184.  
MIL03346 Y000593

Imae N. and Ikeda Y. (2007) Petrology of new Ihzolitic shergottite of Yamato (Y) 000027, Y000047 and Y000097: Main lithologies and shock veins (abs). *Antarctic Meteorites XXXI*, 32-33. Nat. Inst. Polar Res., Tokyo.  
Y000097

Imae N. and Ikeda Y. (2008) Crystallization experiments of intercumulus melts for nakhrites under QFM +/- 2 at 1 bar. *Meteoritics & Planet. Sci.* 43, 1299-1319.

Irving A.J., Kuehner S.M., Rumble D. III, Carlson R.W., Hupé A.C. and Hupé G.M. (2002a) Petrology and isotopic composition of orthopyroxene-bearing nakhelite NWA 998 (abs). *Meteoritics & Planet. Sci.* 37, A70.  
NWA998

Irving A.J., Kuehner S.M., Hupé A.C. and Hupé G.M. (2002b) Olivine-phyric basaltic shergottite NWA1195: a very primitive Martian lava (abs). *Meteoritics & Planet. Sci.* 37, A69.  
NWA1195

Irving A.J. and Kuehner S.M. (2003) Petrology of NWA 1460: A baddelyite-bearing shergottite paired with NWA 480 (abs#1503). *Lunar Planet. Sci. XXXIV* Lunar Planetary Institute, Houston. (CD-ROM)  
NWA1460

Irving A.J., Bunch T.E., Kuehner S.M. and Wittke J.H. (2004a) Petrology of primitive olivine-orthopyroxene-phyric shergottites NWA 2046 and NWA 1195: Analogies with terrestrial boninites and implications for partial melting of hydrous Martian mantle (abs#1444). *Lunar Planet. Sci. XXXV* Lunar Planetary Institute, Houston. (CD-ROM)  
NWA2046 NWA1195

Irving A.J., Herd C.D.K., Kuehner S.M., Gregory D.A. and Aaronson A.A. (2004b) Petrology and redox state of basaltic shergottite NWA 3171 (abs). *Meteoritics & Planet. Sci.* 39, A49.  
NWA3171

Irving A.J., Bunch T.E., Wittke J.H. and Kuehner S.M. (2005) Olivine-orthopyroxene-phyric shergottites NWA 2626 and DaG 476: The Tharsis connection (abs#1229). *Lunar Planet. Sci. XXXVI*, CD-ROM, Lunar Planet. Institute, Houston.  
NWA2626 DaG476

Irving A.J., Kuehner S.M., Korotev R.L. and Hupe G.M. (2007) Baby basaltic shergottite NWA 4480: An

Eu-anomalous Martina magma related to “lherzolitic” shergottites (abs#5127). *Meteoritics & Planet. Sci.* 42, A73.  
NWA4480

Irving A.J., Kuehner S.M., Korotev R.L. and Hupe G.M. (2007) Petrology and bulk composition of primitive enriched olivine basaltic shergottite Northwest Africa 4468 (abs#1526). *Lunar Planet. Sci. XXXVII*. Lunar Planet. Institute, Houston.  
NWA4446

Irving A.J., Bunch T.E., Kuehner S.M., Korotev R.L. and Classen N.C. (2008) Unique ultramafic shergottite Northwest Africa 4797: A highly shocked Martian wehrlite cumulate related to enriched basaltic (not “lherzolitic”) shergottites (abs#2047). *Lunar Planet. Sci. XXXIX* Lunar Planet. Institute, Houston.  
NWA4797

Irving A.J. and Kuehner S.M. (2008) Northwest Africa 5298: A strongly shocked basaltic shergottite equilibrated at QFM and high temperature (abs). *Meteor. & Planet. Sci.* 43, A63.  
NWA5298

Ishii T., Takeda H. and Yanai K. (1979) Pyroxene geothermometry applied to a three-pyroxene achondrite from Allan Hills, Antarctica and ordinary chondrites. *Miner. Jour.* 9, 460-481.  
ALHA77005

Ivanov A. and Zolensky M.E. (2003) The Kaidun meteorite: where did it come from? (abs#1236) *Lunar Planet. Sci. Conf. XXXIV* Lunar Planetary Institute, Houston. (CD-ROM)

Jagoutz E. *et al.* (1979) The abundances of major, minor and trace elements in the earth’s mantle as derived from primitive ultramafic nodules. *Proc. Lunar Planet. Sci. Conf.* 10<sup>th</sup>, 2031-2050.

Jagoutz E. (1986) Sm-Nd and Rb-Sr systematics of the SNC meteorite ALHA77005 (abs). *Lunar Planet. Sci. XVII*, 384-385. Lunar Planetary Institute, Houston  
ALHA77005

Jagoutz E. (1987) New light on shergottites: ALHA77005, the shock age (abs). *Meteoritics* 22, 417-418.  
ALHA77005

Jagoutz E. (1989a) Is the shergottite EETA79001 a breccia? (abs) *Lunar Planet. Sci. XX*, 450-451. Lunar Planetary Institute, Houston  
EETA79001

Jagoutz E. (1989b) Sr and Nd isotopic systematics in ALHA77005: Age of shock metamorphism in shergottites and magmatic differentiation on Mars. *Geochim. Cosmochim. Acta* 53, 2429-2441.  
ALHA77005

Jagoutz E. (1991) Chronology of SNC meteorites. *Space Sci. Rev.* 56, 13-22. (*a review*)

Jagoutz E. (1996) Nd isotopic systematics of Chassigny (abs). *Lunar Planet. Sci. XXVII*, 597-598.  
Lunar Planetary Institute, Houston  
Chassigny

Jagoutz E. (1997a) Why the SNC meteorites might not come from Mars (abs). In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life.* (eds. Clifford *et al.*) *LPI Contribution* 916, 42. Lunar Planetary Institute, Houston.

Jagoutz E. (1997b) Isotopic constraints on differentiation and evolution of SNC meteorites (abs). *Lunar*

*Planet. Sci.* XXVIII, 651-652. Lunar Planetary Institute, Houston  
EETA79001 Chassigny

Jagoutz E. (1998) Models on SNC differentiation processes as constraint by isotopes (abs#1662). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).

Jagoutz E. and Wänke H. (1985a) Sm-Nd and Rb-Sr isotope studies on Shergotty meteorite (abs). *Lunar Planet. Sci.* XVI, Suppl. A, 15-16. Lunar Planetary Institute, Houston  
Shergotty

Jagoutz E. and Wänke H. (1985b) Nd and Sr isotope studies on Shergotty meteorite (abs). *Meteoritics* 20, 672-673.  
Shergotty

Jagoutz E. and Wänke H. (1986) Sr and Nd isotopic systematics of Shergotty meteorite. *Geochim. Cosmochim. Acta* 50, 939-953.  
Shergotty

Jagoutz E. and Wänke H. (1990) Two stage isotopic evolution of SNC meteorites (abs). *Meteoritics* 25, 373.

Jagoutz E., Luck J.M. and Wänke H. (1993a) Os isotopes in SNC meteorites and their implications for the early evolution of Mars and Earth (abs). *Meteoritics* 28, 372-373.  
Chassigny

Jagoutz E., Luck J.M., Othman B. and Wänke H. (1993b) Os isotopes in SNC meteorites and their implications to the early evolution of Mars and Earth (abs). *Lunar Planet. Sci.* XXIV, 711-712. Lunar Planetary Institute, Houston  
Chassigny

Jagoutz E., Sorowka A., Vogel J. D. and Wänke H. (1994) ALH84001: Alien or progenitor of the SNC family? (abs) *Meteoritics* 29, 478-479.  
ALH84001

Jagoutz E. and Dreibus G. (1997) On the significance of the internal ages and the associated chemical changes in SNC meteorites (abs). *Meteoritics & Planet. Sci.* 32, A66-67.

Jagoutz E., Bogdanovski O., Krestina N. and Jotter R. (1999) DAG: A new age in the SNC family, or the first gathering of relatives (abs#1808). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston.  
(CD-ROM)  
DaG476

Jagoutz E. and Dreibus G. (2000) Isotopic systematics of SNC meteorites (abs). *Antarctic Meteorites* XXV. Nat. Inst. Polar Res., Tokyo.

Jagoutz E. and Jotter R. (2000) New Sm-Nd isotopic data on Nakhla minerals (abs#1609). *Lunar Planet. Sci.* XXXI Lunar Planetary Institute, Houston (CD-ROM).  
Nakhla

Jagoutz E. and Kubny A. (2000) Vibrational spectroscopic study of feldspathic glasses in SNC meteorites (abs#1218). *Lunar Planet. Sci.* XXXI Lunar Planetary Institute, Houston (CD-ROM).

Jagoutz E., Jotter R. and Dreibus G. (2000) Evolution of six SNC meteorites with anomalous Neodinium-142 (abs). *Meteoritics & Planet. Sci.* 35, A83.

- Jagoutz E., Jotter R., Dreibus G. and Zartman R. (2001a) New U-Pb isotopic data on SNC meteorites (abs#1307). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
Nakhla SaU005
- Jagoutz E., Jotter R. and Zartman R. (2001b) Initial Pb isotopes and Rb-Sr isotopic systematics of some SNC meteorites (abs). *Meteoritics & Planet. Sci.* 36, A89-90.
- Jagoutz E., Dreibus G., Jotter R., Kubny A. and Zartman R. (2002) New U-Pb data on clean Nakhla minerals (abs). *Meteoritics & Planet. Sci.* 37, A71.  
Nakhla
- Jagoutz E. and Dreibus G. (2002) New aspects in the isotopic systematics of shergottites (abs). Un-mixing SNCs. 25-26. LPI Contribution No. 1134. Lunar Planetary Institute, Houston (CD-ROM).
- Jagoutz E., Dreibus G. and Jotter R. (2003) On the search for a neodymium-142 anomaly in terrestrial and Martian rocks (abs). International Symposium. *Evolution of Solar System: A New Perspective from Antarctic Meteorites*, 47-48. Nat. Inst. Polar Res., Tokyo.  
Y980459
- Jagoutz E., Dreibus G. and Jotter R. (2003) New  $^{142}\text{Nd}$  data on SNC meteorites (abs). *Geochim. Cosmochim. Acta* 67, A184
- Jagoutz E., Kubny J.R. and Zartman R. (2006) New U-Th and Pb isotope data of SNC meteorites (abs#1577). *Lunar Planet. Sci. Conf.* XXXVII Lunar Planetary Institute, Houston
- Jagoutz E., Bowring S., Jotter R. and Dreibus G. (2009) New U-Th-Pb data on SNC meteorites ALH84001 (abs#1662). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.  
ALH84001
- Jakosky B.M. (1991) Mars volatile evolution: Evidence from stable isotopes. *Icarus* 94, 14-31.
- Jakosky B.M. (1993) Mars volatile evolution: Implications of the recent measurement of  $^{17}\text{O}$  in water from the SNC meteorites. *Geophys. Res. Lett.* 20, 1591-1594.
- Jakosky B.M. (1997a) The case for life on Mars. *The Planetary Report* XVII, 12-17.
- Jakosky B.M. (1997b) Mars Life ? One year later. *The Planetary Report* XVIII, 10-14.  
ALH84001
- Jakosky B.M. (1997c) Martian exobiology: Introduction. *J. Geophys. Res.* 102, 23673-23674.
- Jakosky B.M. (1998a) *The search for life on other planets*. Cambridge University Press. Cambridge. 336 pp. (see review by Bada)  
ALH84001
- Jakosky B.M. and Jones J.H. (1995) Mars volatile evolution from SNC and planetary data analysis (abs). *Lunar Planet. Sci.* XXVI, 667-668. Lunar Planetary Institute, Houston
- Jakosky B.M. and Jones J.H. (1997) The history of Martian volatiles. *Rev. of Geophysics* 35, 1-16.
- Jakosky B.M. and Phillips R.J. (2001) Mars' volatile and climate history. *Nature* 412, 237-244.
- Jambon A., Barrat J.A., Gillet Ph., Göpel C., Javoy M., Joron J-L. and Sautter V. (2001) One more shergottite from North Western Africa (abs). *Meteoritics & Planet. Sci.* 36, A90.  
NWA856

- Jambon A., Barrat J.A., Sautter V., Gillet Ph., Göpel C., Javoy M., Joron J-L. and Lesourd M. (2002) The basaltic shergottite North West Africa 856: Petrology and chemistry. *Meteoritics & Planet. Sci.* 37, 1147-1164.  
NWA856
- Jambon A., Bohm M., Boudouma O., Chennaoui-Aoudjehane H. and Franchi I. (2003) Al Mala'ika (NWA 1669): A new shergottite from Morocco /mineralogy and petrology (abs). *Meteoritics & Planet. Sci.* 38, A43.  
NWA1669
- Jambon A., Chennaoui-Aoudjehane H. and ElGoresy Ah. (2008) Peak equilibrium shock pressure in shergottite NWA856 (abs#2545). *Lunar Planet. Sci.XXXIX* Lunar Planet. Inst. Houston. (CD-ROM)  
NWA856
- Jarosewich E. (1980) Chemical analyses of some Allan Hills meteorites. In *Smithson. Contrib. Earth Sci.* 23, 48.  
ALHA77005
- Jarosewich E. (1984) Bulk chemical analyses of Antarctic meteorites, with notes on weathering effects on FeO, Fe-metal, FeS, H<sub>2</sub>O and C. *Smithson. Contrib. Earth Sci.* 26, 111-114. Washington, DC.  
ALHA77005
- Jarosewich E. (1990a) Chemical analyses of meteorites: A compilation of stony and iron meteorite analyses. *Meteoritics* 25, 323-337.  
ALHA77005 EETA79001
- Jarosewich E. (1990b) Homogenized powders of Antarctic meteorites. *Antarctic Meteorite Newsletter* 13 (1), 134.  
ALHA77005 EETA79001
- Jérémie E., Orcel J. and Sandréa A. (1962) Etude minéralogique et structurale de la météorite de Chassigny. *Bull. Soc. Fr. Mineral. Cristalogr.* 85, 262-266.  
Chassigny
- Jérôme D.Y. (1970) *Composition and origin of some achondrite meteorites*. PhD Dissertation. Univ. Oregon.  
Shergotty Chassigny
- Jérôme D.Y. and Goles G.G. (1971) A re-examination of the relationships among pyroxene-plagioclase achondrites. In *Activation Analysis in Geochemistry and Cosmochemistry* (eds. Brunfelt and Steinnes) 261-266. Universitesforaget, Oslo.
- Jessberger E.K. (1991) Discussion: Returned Martian samples. *Space Science Rev.* 56, 59-63.
- Jessberger E.K., Schaffer O.A., Warasila R., Walker R. and Labotka T. (1981) Unmasking "extra" <sup>40</sup>Ar in ALHA77005 by the laser extraction technique (abs). *Meteoritics* 16, 331-332.  
ALHA77005
- Jochum K.P. and Palme H. (1987) Abundances and ratios of refractory elements in SNC-meteorites and eucrites (abs). *Meteoritics* 22, 420-421.
- Jochum K.P. and Palme H. (1990) Alkali elements in eucrites and SNC-meteorites: No evidence for volatility related losses during magmatic eruption or thermal metamorphism (abs). *Meteoritics* 25,

373-374.

Zagami Shergotty Lafayette Nakhla EETA79001 ALHA77005 Chassigny

Jochum K. P., Stoll B., Amini M. and Palme H. (2001) Limited trace element fractionation in SNC meteorites (abs). *Meteoritics & Planet. Sci.* 36, A90-91.

Johnson M.C., Rutherford M.J. and Hess P.C. (1989) Experimental study of igneous kaersutite stability with application to SNC petrogenesis (abs). *Lunar Planet. Sci.* XX, 472-473. Lunar Planetary Institute, Houston.

Johnson M.C., Rutherford M.J. and Hess P.C. (1991) Chassigny petrogenesis: Melt compositions, intensive parameters, and water contents of Martian (?) magmas. *Geochim. Cosmochim. Acta* 55, 349-366.

Chassigny

Jones J.H. (1985a) The youngest meteorites: I. A 180 m.y. igneous age for the shergottites - The constraint of petrography (abs). *Lunar Planet. Sci.* XVI, 406-407. Lunar Planetary Institute, Houston. EETA79001

Jones J.H. (1985b) The youngest meteorites: III. Implications of 180 m.y. igneous activity on the SPB (abs). *Lunar Planet. Sci.* XVI, 408-409. Lunar Planetary Institute, Houston.

Jones J.H. (1986) A discussion of isotopic systematics and mineral zoning in the shergottites: Evidence for a 180 m.y. igneous crystallization age. *Geochim. Cosmochim. Acta* 50, 969-977.

Jones J.H. (1988) Speculations on the igneous history of Mars: Inferences from the SNC meteorites. In *Workshop on Mars Sample Return Science*. (eds Drake et al.) *LPI Tech. Rpt.* 88-07, 97-98. Lunar Planetary Institute, Houston.

Jones J.H. (1989) Isotopic relationships among the shergottites, the nakhrites and Chassigny. *Proc. Lunar Planet. Sci. Conf.* 19th, 465-474. Lunar Planetary Institute, Houston.  
Shergotty Zagami ALHA77005 EETA79001 Nakhla Chassigny

Jones J.H. (1992) Distribution of water on Mars: Implications from SNC meteorites (abs). In *Workshop on the Martian surface and atmosphere through time*. *LPI Tech Rpt.* 92-0, 78-79. Lunar Planetary Institute, Houston.

Jones J.H. (1993) SNC meteorites and their implications for reservoirs of Martian volatiles. In *Mars: Past present and future - results from the MSATT program*. (ed. Haberle) *LPI Tech. Rpt.* 93-06, Lunar Planetary Institute, Houston.

Jones J.H. (1996) Martian volatiles: Insights from the SNC meteorites (abs). In *Workshop on evolution of Martian volatiles*. (eds. Jakosky and Treiman) *LPI Tech. Rpt.* 96-01, 30-31. Lunar Planetary Institute, Houston.  
EETA79001 ALH84001 Shergotty Zagami Chassigny

Jones J.H. (2001) Alternative view of Martian Pb and Os (abs#1355). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)

Jones J.H. (2002a) Volatile element reservoirs on Mars: C and H isotopic signatures of crust, mantle and aquifer (abs#1150). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)

Jones J.H. (2002b) SNC meteorites and Martian reservoirs (abs). Un-mixing SNCs. 27-28. LPI Contribution No. 1134. Lunar Planetary Institute, Houston

- Jones J.H. (2003a) A liquidus geothermometer for SNC, lunar and eucritic magmas (abs#1130). *Lunar Planet. Sci. Conf.* 34<sup>th</sup>, Lunar Planetary Institute, Houston (CD-ROM).
- Jones J.H. (2003b) Constraints on the structure of the Martian interior determined from the chemical and isotopic systematics of the SNC meteorites. *Meteoritics & Planet. Sci.* 38, 1807-1814.
- Jones J.H. (2005) Isotopic constraints on the petrology of Martian meteorites (abs#1860). *Lunar Planet. Sci.* XXXVI, (CD-ROM) Lunar Planet. Institute, Houston.
- Jones J.H. (2007) The shergottites are young (period). *Meteoritics & Planet. Sci.* 42, A77.  
Shergotty Zagami
- Jones J.H., Benjamin T.M., Duffy C.J., Rogers P.S.Z., Hollander M. and Maggiore C.J. (1985a) A tale of two phosphates: REE reservoirs in the Shergotty meteorite (abs). *Meteoritics* 20, 674-675.  
Shergotty
- Jones J.H., Benjamin T.M., Hollander M., and Conner J. (1985b) The youngest meteorites: II. Trace element zoning in Zagami maskelynite (abs). *Lunar Planet. Sci.* XVI, 410-411. Lunar Planetary Institute, Houston  
Zagami
- Jones J.H., Jurewicz A.J.G. and Le. L. (1991) A liquidus phase diagram for a primitive shergottite (abs). *Meteoritics* 26, 353.  
EETA79001 Shergotty Zagami
- Jones J.H., Borg L.E. and Nyquist L.E. (1997) Contrasting styles of differentiation for the Earth, Moon and Mars (abs). *7th Goldschmidt. Conf., LPI Contribution* 921, 108. Tucson.
- Jones J.H. and Schwandt C.S. (1998) Experimental investigations of the high-temperature stability of siderite: Implications for the origin of ALH84001 carbonates (abs#1425). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001
- Jovanovic S. and Reed G.W. (1987) Isotopically anomalous Hg in Antarctic achondrites. *J. Geophys. Research Lett.* 14, 1127-1130.  
Shergotty ALH84001 EETA79001
- Jull A.J.T. and Donahue D.J. (1988) Terrestrial <sup>14</sup>C age of the Antarctic shergottite EETA79001. *Geochim. Cosmochim. Acta* 52, 1309-1311.  
EETA79001
- Jull A.J.T., Donahue D.J. and Linick T.W. (1989) Trends in carbon-14 terrestrial ages of Antarctic meteorites from different sites (abs). *Lunar Planet. Sci.* XX, 488-489. Lunar Planetary Institute, Houston  
ALH84001
- Jull A.J.T., Donahue D.J., Swindle T.D., Burkland M.K., Herzog G.F., Albrecht A., Klein J. and Middleton R. (1992) Isotopic studies relevant to the origin of the “white druse” carbonates on EETA79001 (abs). *Lunar Planet. Sci.* XXIII, 641-642. Lunar Planetary Institute, Houston  
EETA79001
- Jull A.J.T., Donahue D.J., Eastoe C.J., Swindle T.D., Burkland M.K. and Herzog G.F. (1994a) Isotopic evidence for extraterrestrial carbonates in the SNC meteorites ALH84001 and Nakhla (abs). *Meteoritics* 29, 479.  
ALH84001 Nakhla

Jull A.J.T., Cielaszyk E., Brown S.T. and Donahue D.J. (1994b)  $^{14}\text{C}$  terrestrial ages of achondrites from Victoria Land, Antarctica (abs). *Lunar Planet. Sci.* XXV, 647-648. Lunar Planetary Institute, Houston  
LEW88516 ALH84001

Jull A.J.T., Eastoe C.J., Xue S. and Herzog G.F. (1995) Isotopic composition of carbonate in the SNC meteorites ALH84001 and Nakhla. *Meteoritics* 30, 311-318.  
Nakhla ALH84001

Jull A.J.T., Cloudt S. and Eastoe C.J. (1996a) Isotopic composition of carbonates in some SNC meteorites (abs). In *Workshop on evolution of Martian volatiles*. (eds. Jakosky and Treiman) *LPI Tech. Rpt.* 96-01, 22-23. Lunar Planetary Institute, Houston.  
ALH84001 Nakhla Zagami

Jull A.J.T., Cloudt S. and Eastoe C.J. (1996b) The  $^{14}\text{C}$  and stable isotopic composition of carbonates in SNC meteorites (abs). *Meteoritics & Planet. Sci.* 31, A68.  
ALH84001 Nakhla Zagami

Jull A.J.T., Eastoe C.J. and Cloudt S. (1997a) Isotopic composition of carbonates in the SNC meteorites, Allan Hills 84001 and Zagami. *J. Geophys. Res.* 102, 1663-1669.  
ALH84001 Zagami Nakhla

Jull A.J.T., Eastoe C.J. and Cloudt S. (1997b) Terrestrial age of the Lafayette meteorite and stable-isotopic composition of weathering products (abs). *Lunar Planet. Sci.* XXVIII, 685-686. Lunar Planetary Institute, Houston  
Lafayette

Jull A.J.T., Cloudt S., Courtney C. and Eastoe C.J. (1997c) Carbon-14 and stable-isotopic composition of organic material and carbonates from some SNC meteorites (abs). *Meteoritics & Planet. Sci.* 32, A68.  
EETA79001

Jull A.J.T., Courtney C., Jeffrey D.A. and Beck J.W. (1998a) Isotopic evidence for a terrestrial source of organic compounds found in Martian meteorites Allan Hills 84001 and Elephant Moraine 79001. *Science* 279, 366-369.  
ALH84001 EETA79001

Jull A.J.T., Beck J.W., Courtney C. and Jeffrey D.A. (1998b) Carbon isotopic evidence for terrestrial organic compounds found in some Martian meteorites (abs#1184). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Jull A.J.T., Cloudt S. and Cielaszyk E. (1998c)  $^{14}\text{C}$  terrestrial ages of meteorites from Victoria Land, Antarctica, and the infall rates of meteorites. In Grady, Hutchison, McCall and Rothery (eds) "Meteorites: flux with time and impact effects". Geological Society Spec. Pub. No. 140, London  
ALH84001

Jull A.J.T., Beck J.W., Burr G.S., Gilmour I.A., Sephton M.A. and Pillinger C.T. (1999a) Isotopic evidence for abiotic organic compounds in the Martain meteorite Nakhla (abs). *Meteoritics & Planet. Sci.* 34, A60.  
Nakhla

Jull A.J.T., Klandrud S.E., Schnabel C., Herzog G.F., Nishiizumi K. and Caffee M.W. (1999b) Cosmogenic radionuclide studies of the nakhellites (abs#1004). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM)

Nakhla Lafayette Governor Valadares

Jull A.J.T., Beck J.W. and Burr G.S. (2000) Isotopic evidence for extraterrestrial organic matter in the martian meteorite Nakhla. *Geochim. Cosmochim. Acta* 64, 3763-3772.  
Nakhla

Jurewicz A.J.G., Le L. and Jones J.H. (1991) A liquidus phase diagram for a primitive shergottite (abs). *Meteoritics* 26, 353.  
ALH79001 Shergottite Zagami

Kaiden H., Mikouchi T. and Miyamoto M. (1997) Cooling rates of olivine xenocrysts in the EET79001 shergottite (abs). *NIPR Sym. Antarctic Meteorites* 22nd, 75-77. Nat. Inst. Polar Res., Tokyo.  
EETA79001

Kaiden H., Mikouchi T. and Miyamoto M. (1998) Cooling rates of olivine xenocrysts in the EET79001 shergottite. *Antarctic Meteorite Res.* 11, 92-102. Nat. Inst. Polar Res., Tokyo.  
EETA79001

Kaneda K., McKay G.A. and Le L. (1997a) Synthetic and natural Nakhla pyroxenes: Minor elements composition (abs). *Lunar Planet. Sci. XXVIII*, 693-694. Lunar Planetary Institute, Houston  
Nakhla

Kaneda K., McKay G.A. and Le L. (1997b) Comparison between synthetic and natural Nakhla pyroxenes: Minor elements composition (abs). *NIPR Sym. Antarctic Meteorites* 22nd, 80-82. Nat. Inst. Polar Res., Tokyo.  
Nakhla

Kaneda K., McKay G.A. and Le L. (1998) Synthetic and natural Nakhla pyroxenes: A close match at last (abs#1620). *Lunar Planet. Sci. XXIX* Lunar Planetary Institute, Houston (CD-ROM).

Karlsson H.R., Clayton R.N., Gibson E.K., Mayeda T.K. and Socki R.A. (1991) Extraterrestrial water of possible Martian origin in SNC meteorites: Constraints from oxygen isotopes (abs). *Meteoritics* 26, 354-355.

Karlsson H.R., Clayton R.N., Gibson E.K., Jr. and Mayeda T.K. (1992) Water in SNC meteorites: Evidence for a Martian hydrosphere. *Science* 255, 1409-1411.  
Nakhla Shergottite Zagami Chassigny Lafayette EETA79001

Karlsson H.R., Clayton R.N., Mayeda T.K., Jull A.J.T. and Gibson E.K. (1993) Martian carbon dioxide: Clues from isotopes in SNC meteorites (abs). *Lunar Planet. Sci. XXIV*, 757-758. Lunar Planetary Institute, Houston  
Nakhla Shergottite Zagami Chassigny Lafayette EETA79001

Karner J., Papike J.J. and Shearer C.K. (2003) Olivine from planetary basalts: chemical signatures that indicate planetary parentage and those that indicate igneous setting and process. *Amer. Min.* 88, 806-816.

Karner J.M., Sutton S.R., Papike J.J., Shearer C.K., Jones J.H. and Newville M. (2006) Application of a new vanadium valence oxybarometer to basaltic glasses from the Earth, Moon and Mars. *Am. Mineral.* 91, 270-277.

Karner J.M., Papike J.J., Sutton S.R., Shearer C.K., McKay G., Le L. and Burger P. (2007) Valence state partitioning of Cr between pyroxene-melt: Effects of pyroxene and melt composition and direct determination of Cr valence states by XANES. Application to Martian basalt QUE94201 composition. *Amer. Mineral.* 92, 2002-2005.

QUE94201

Karner J.M., Papike J.J. Shearer C.K., McKay G., Le. L. and Burger P. (2007) Valance state partitioning of Cr and V between pyroxene-melt: Estimates of oxygen fugacity for martian basalt QUE 94201. *Amer. Mineral.* 92, 1238-1241.

QUE94201

Karner J.M., Papike J.J. Shearer C.K., McKay G. and Burger P. (2006) Valance state partitioning of Cr and V between pyroxene – melt: Estimate of oxygen fugacity for martian basalt QUE 94201 (abs).  
QUE94201

Karner J.M., Papike J.J. Sutton S.R., Shearer C.K., Burger P., McKay G. and Le L. (2008) Valance state partitioning of vanadium between pyroxene-melt: Effects of pyroxene and melt composition and direct determination of V valance by XANES (abs#1110). *Lunar Planet. Sci. XXXIX*, Lunar Planetary Institute, Houston.

Karner J.M., Papike J.J., Sutton S.R., Schearer C.K., Burger P., McKay G. and Le L. (2008) Valance state partitioning of V between pyroxene-melt: Effects of pyroxene and melt composition, and direct determination of V valence states by XANES. Application to Martain basalt QUE 94201 composition. *Meteor. & Planet. Sci.* 43, 1275-1285.

QUE 94201

Karner J.M., Papike J.J., McKay G., Sutton S.R., Schearer C.K., Burger P. and Le L. (2008) The partitioning of Cr and V between pyroxene-melt in Martain basalt QUE 94201 (abs). *Meteor. & Planet. Sci.* 43, A70.  
QUE 94201

Karner J.M., Papike J.J., Shearer C.K. and Burger P.V. (2009) Chemical signatures in plagioclase from Martian meteorites (abs#1327). *Lunar Planet. Sci. XL*, Lunar Planetary Institute, The Woodlands.

Kashkarov L.L., Bulgakova L.M., Assonov S.S., Kalinina G.V. and Shukolyukov Yu. A. (1996) Thermal alteration effects of the large olivine grains of the Zagami meteorite (abs). *Lunar Planet. Sci. XXVII*, 651-652. Lunar Planetary Institute, Houston.  
Zagami

Kashkarov L.L., Ivliev A.I. and Bulgakova L.M. (1997) Thermoluminescence features in different olivine grains for Zagami meteorite (abs). *Lunar Planet. Sci. XXVIII*, 699-700. Lunar Planetary Institute, Houston.  
Zagami

Kayama M., Nakazato T., Nishido H., Ninagwa K., Gucsik A. and Berczi Sz. (2008) Shock pressure estimation for Martian meteorites (Dhofar 019) by Raman spectroscopy and cathodoluminescence (abs). *Meteor. & Planet Sci.* 43, A72.

Keller L.P., Treiman A.H. and Wentworth S.J. (1992) Shock effects in the shergottite LEW88516: Optical and electron microscope observations (abs). *Meteoritics* 27, 242.  
LEW88516

Kennedy J.D. and Harvey R.P. (2005) Geochemistry, mineralogy and weathering of the Antarctic Ferrar dolerite with implications for Martian meteorites and surface processes (abs). *Meteoritics & Planet. Sci.* 40, A80.

Kent A.J.R., Hutcheon I.D., Ryerson F.J. and Phinney D.L. (1999) The temperature of formation of carbonates in Martian meteorite ALH84001: Constraints from cation diffusion (abs#1473). *Lunar Planet. Sci. XXX*, Lunar Planetary Institute, Houston (CD-ROM)

ALH84001

Kent A.J.R., Hutcheon I.D., Ryerson F.J. and Phinney D.L. (2001) The temperature of formation of carbonate in Martian meteorite ALH84001: Constraints from cation diffusion. *Geochim. Cosmochim. Acta* 65, 311-321.

ALH84001

Kerr R.A. (1996) Ancient life on Mars? *Science* 273, 864-866.

Kerr R.A. (1997a) Martian ‘microbes’ cover their tracks. *Science* 276, 30-31.

Kerr R.A. (1997b) Putative Martian microbes called microscopy artifacts. *Science* 278, 1706-1707.

Kerr R.A. (2002) Reversals reveal pitfall in spotting ancient and ET life. *Science* 296, 1384-1385.

Kerridge J.F. (1988) Deuterium in Shergotty and Lafayette (and on Mars?) (abs) *Lunar Planet. Sci. XIX*, 599-600. Lunar Planet. Institute, Houston  
Shergotty Lafayette

Kerridge J.F. (1997) Martian exobiology in the post-Allan Hills 84001 Era: Some key issues (abs).

*Meteoritics & Planet. Sci.* 32, A71.  
ALH84001

Kerridge J.F. and many others (1995) *An Exobiology Strategy for Mars Exploration*. NASA SP-530, NASA-HQ, Code S, Washington, D. C.

Kichinka K. (1998a) El Nakhla. *Meteorite!* May issue.

Kichinka K. (1998b) Nakhla, Part II. *Meteorite!* August issue.

Kichinka K. (2001a) Chassigny: The first Martian harvest. *Meteorite!* Vol. 7, 14-18. August issue.

Kichinka K. (2001b) Chassigny: The first Martian harvest, Part II. *Meteorite!* November issue.

Kiefer W.S. (2002) Melting the martian mantles: Shergottite formation and implications for present day mantle convection on Mars (abs). Un-mixing SNCs. 29-30. LPI Contribution No. 1134. Lunar Planet. Inst. Houston.

Kiefer W.S. (2003) Melt in the Martian mantle: Shergottite formation and implications for the present-day mantle convection on Mars. *Meteoritics & Planet. Sci.* 38, 1815-1832.

Kim S-T. and Farquhar J. (2008) Multiple sulfur isotope compositions in Martian meteorite MIL03346 (abs#2151). *Lunar Planet. Sci. XXXIX*. Lunar Planet. Inst. Houston.  
MIL03346

King T.V.V., Score R., Gabel E.M. and Mason B. (1980) Meteorite descriptions. In *Catalog of Antarctic Meteorites 1977-1978*. (eds. Marvin and Mason) *Smithson. Contrib. Earth Sci.* 23, 39. Washington, DC.  
ALHA77005

King P.L., Guan Y., Vennemann T.W., Leshin L.A. and Sharp Z.D. (2009) The role of dehydrogenation of the hydrogen contents and deltaD values of kaersutites (abs#2322). *Lunar Planet. Sci. XL*, Lunar Planetary Institute, The Woodlands.

Kinman W.S. and Neal C.R. (2005) Petrology of nakhelite MIL03346 (abs#1660). *Lunar Planet. Sci.*

XXXVI Lunar Planet. Institute, Houston.  
MIL03346

Kirschvink J.L., Maine A.T. and Vali H. (1997a) Paleomagnetic evidence of a low-temperature origin of carbonate in the Martian meteorite ALH84001. *Science* 275, 1629-1633.  
ALH84001

Kirschvink J.L., Maine A.T. and Vali H. (1997b) Paleomagnetic evidence supports a low-temperature origin of the carbonate in Martian meteorite ALH84001(abs). *Lunar Planet. Sci.* XXVIII, 731-732.  
Lunar Planet. Institute, Houston.  
ALH84001

Kirschvink J.L. and Vali H. (1999) Criteria for the identification of bacterial magnetofossils on Earth and Mars (abs#1681). *Lunar Planet. Sci.* XXX , Lunar Planetary Institute, Houston (CD-ROM)

Kirschvink J.L., Kim S., Weiss B.P., Shannon D.M. and Kobayashi A.K. (2002) Rock magnetic and ferromagnetic resonance tests of biogenic magnetite in ALH84001 (abs#1991). *Lunar Planet. Sci.* XXXIII, Lunar Planetary Institute, Houston. (CD-ROM)  
ALH84001

Kirsten T., Ries D. and Fireman E.L. (1978) Exposure and terrestrial ages of four Allan Hills, Antarctic meteorites. *Meteoritics* 13, 519-522.

Kleine T., Münker C., Mezger K., Palme H. and Bischoff A. (2003)  $^{182}\text{Hf}$ - $^{182}\text{W}$  constraints on the early evolution of the Martian mantle (abs). *Meteoritics & Planet. Sci.* 38, A111.

Kleine T., Münker C., Mezger K. and Palme H. (2002) Rapid accretion and early core formation on asteroids and the terrestrial planets from Hf-W chronology. *Nature* 418, 952-955.

Kleine T., Mezger K., Münker C., Palme H. and Bischoff A. (2004)  $^{182}\text{Hf}$ - $^{182}\text{W}$  isotope systematics of chondrites, eucrites, martian meteorites: Chronology of core formation and early mantle differentiation in Vesta and Mars. *Geochim. Cosmochim. Acta* 68, 2935-2946.  
EETA79001 DaG476 SaU051

Kletetschka G., Wasilewski P.J. and Taylor P.T. (2000) Mineralogy of the sources for magnetic anomalies on Mars. *Meteoritics & Planet. Sci.* 35, 895-899.

Klossa B., Lorin J.C. and McKay C.P. (2003) Organic matter associated with carbonates in the SNC meteorite ALH84001: A SIMS study (abs). *Meteoritics & Planet. Sci.* 38, A121.  
ALH84001

Kminek G. and Bada J.L. (2006) The effect of ionizing radiation on the preservation of amino acids on Mars. *Earth Planet. Sci. Lett.* 245, 1-5.

Knauth L.P., Brilli M. and Klonowski S. (2003) Isotopic geochemistry of calichi developed on basalt. *Geochim Cosmochim. Acta* 67, 185-195.  
ALH84001

Knoll A., Osborn M.J., Baross J., Berg H.C. and Sogin M. (1999) Size limits of very small microorganisms. Proc. of Workshop. National Research Council, NAS Press Washington pp.148

Knott S.F., Ash R.D. and Turner G. (1995)  $^{40}\text{Ar}$ - $^{39}\text{Ar}$  dating of ALH84001: Evidence for the early bombardment of Mars (abs). *Lunar Planet. Sci.* XXVI, 765-766. Lunar Planetary Institute, Houston  
ALH84001

Knott S.F. (1996) *A study of helium and argon isotopes in extraterrestrial dust and a meteorite from Mars.* PhD thesis. Manchester.  
ALH84001

Knudsen J.M. (1992) Magnetic phases in SNC-meteorites and on Mars. (abs) *Meteoritics* 27, 244.

Kobayashi A. and Taguchi T. (2002) Biological control of magnetite crystal formation in the magnetotactic bacteria: hints concerning the possible evidence from ALH84001 for life on Mars (abs). *Geochim. Cosmochim. Acta* 66, A408.  
ALH84001

Koblitz J. (2006) *Metbase: Meteorite data retrieval program.* Ver 2.0, Fisherude.  
<http://www.metbase.de/home.html>

Koizumi E., Mikouchi T., McKay G.A., Le L. and Schwandt C. (2001) Dynamic crystallization of the Queen Alexandra Range 94201 shergottite (abs). *Meteoritics & Planet. Sci.* 36, A102.  
QUE94201

Koizumi E., McKay G.A., Mikouchi T., Le L., Schwandt C., Monkawa A. and Miyamoto M. (2002a) Crystallization experiments of the Martian meteorite QUE94201: Additional constraints on its formation condition (abs#1442). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)  
QUE94201

Koizumi E., Mikouchi T., McKay G.A., Le L., Schwandt C., Monkawa A. and Miyamoto M. (2002b) Comparative cooling experiments of Queen Alexandra Range 94201 basaltic shergottite under reducing and oxidizing conditions (abs). *Meteoritics & Planet. Sci.* 37, A80.  
QUE94201

Koizumi E., Mikouchi T., McKay G., Le L., Schwandt C., Monkawa A. and Miyamoto M. (2002c) Effects of cooling rate and oxygen fugacity on the crystallization of the Queen Alexander Range 94201 Martian melt composition (abs). *Antarctic Meteorites* XXVII, 63-65. Nat. Inst. Polar Res., Tokyo.  
QUE94201

Koizumi E., Mikouchi T., Monkawa A. and Miyamoto M. (2003a) Crystallization experiments of Dar al Gani Martian meteorites: A preliminary report (abs#1567). *Lunar Planet. Sci.* XXXIV Lunar Planetary Institute, Houston  
DaG476

Koizumi E., Mikouchi T., Monkawa A. and Miyamoto M. (2003b) The origin of olivine megacryst in the Dar al Gani 476 basaltic shergottite and its paired meteorites: Verification of three models (abs). International Symposium. *Evolution of Solar System: A New Perspective from Antarctic Meteorites*, 56-57. Nat. Inst. Polar Res., Tokyo.  
Y980459

Koizumi E., Mikouchi T., Miyamoto M., Monkawa A., Chokai J. and McKay G. (2004a) Cooling rate of olivine megacryst in Yamato 980459 olivine-phyric shergottite (abs). *Meteoritics & Planet. Sci.* 39, A54.  
Y980459

Koizumi E., Mikouchi T., McKay G., Monkawa A., Chokai J. and Miyamoto M. (2004b) Yamato 980459: Crystallization of Martian magnesian magma (abs#1494). *Lunar Planet. Sci.* XXXV Lunar Planetary Institute, Houston  
Y980459

Koizumi E., Mikouchi T., Monkawa A. and Miyamoto M. (2004c) Origin of olivine megacrysts and the groundmass crystallization of the Dar al Gani 476 shergottite. *Antarct. Meteorite Res.* 17, 84-96. Nat. Inst. Polar Res., Tokyo.  
DaG476

Koizumi E., Mikouchi T., Chokai J. and Miyamoto M. (2005) Crystallization experiment of Los Angeles basaltic shergottite: Implications for the crystallization of Los Angeles and Dhofar 373 (abs#2015). *Lunar Planet. Sci. XXXVI* CD-ROM, Lunar Planet. Institute, Houston.  
Los Angeles Dho373

Kojima H. (2006) Lherzolitic Shergottite. *Antarctic Newsletter* 14. Nat. Inst. Polar Res., Tokyo  
Y000027 Y000047 000097

Kojima H., Miyamoto M. and Warren P.H. (1997a) The Yamato-793605 Martian meteorite consortium (abs). *NIPR Sym. Antarctic Meteorites* 22nd, 91-93. Nat. Inst. Polar Res., Tokyo.  
Y793605

Kojima H., Miyamoto M. and Warren P.H. (1997b) The Yamato-793605 Martian meteorite consortium. *Antarctic Meteorite Res.* 10, 3-12. Nat. Inst. Polar Res., Tokyo.  
Y793605

Kojima H., Nakamura N., Imae N. and Misawa K. (2002) The Yamato nakhlite consortium (abs). *Antarctic Meteorites* XXVII, 66-68. Nat. Inst. Polar Res., Tokyo.  
Y000583 Y000749 Y000802

Kondorosi G., Hirota Y., Hori K., Nakamura N., Morikawa N. and Misawa K. (1999) Trace element studies of leachates and residues from the lherzolitic shergottite Y-793605 (abs). *NIPR Sym. Antarctic Meteorites* 24th, 88-89. Nat. Inst. Polar Res., Tokyo.  
Y793605

Kong P., Ebihara M. and Palme H. (1999a) Highly siderophile elements in Martian meteorites (abs#1570). *Lunar Planet. Sci. XXX* Lunar Planetary Institute, Houston (CD-ROM)  
Nakhla ALH84001

Kong P., Ebihara M. and Palme H. (1999b) Siderophile elements in Martian meteorites and implications for core formation in Mars. *Geochim. Cosmochim. Acta* 63, 1865-1875.  
Nakhla Zagami EET77001 Y793605 ALH77005 ALH84001

Kolb C., Abart R., Wappis E., Penz T., Jessberger K. and Lammer H. (2003) The meteoritic component of the surface of Mars: Implications for organic and inorganic geochemistry (abs). 66<sup>th</sup> Meteoritical Society, Munster.

Korochantseva E.V., Trieloff M., Buikin A.I. and Hopp J. (2008) Hihg 40Ar/39Ar ratios of trapped argon from Martian interior and atmosphere in shrgottites (abs#1566). *Lunar Planet. Sci. XXXIX* Lunar Planet. Inst. Houston. (CD-ROM)  
Shergotty

Kothari B.K. and Goel P.S. (1974) Total nitrogen in meteorites. *Geochim. Cosmochim. Acta* 38, 1493-1508.  
Shergotty

Kopp R.E. and Humayun M. (2003) Kinetic model of carbonate dissolution in Martian meteorite ALH84001. *Geochim. Cosmochim. Acta* 67, 3247-3256.  
ALH84001

Kozar M.P., Krahmer M.T., Fox A., Larsson L. and Allton J. (2001) Lunar Dust: A negative control for biomarker analysis of extraterrestrial samples? *Geochim. Cosmochim. Acta* 65, 3307-3317.

Koziol A.M. (1999) Experimental determination of siderite (iron carbonate) stability under moderate pressure-temperature conditions and applications to Martian paragenesis (abs#1226). *Lunar Planet. Sci. XXX*, Lunar Planetary Institute, Houston (CD-ROM)  
ALH84001

Koziol A.M. (2000) Carbonate and magnetite parageneses as monitors of carbon dioxide and oxygen fugacity (abs#1424). *Lunar Planet. Sci. XXXI* Lunar Planetary Institute, Houston (CD-ROM).

Koziol A.M. (2001) Magnetite and carbonate textures in ALH84001: Experimental insights (abs#1425). *Lunar Planet. Sci. XXXII*, Lunar Planetary Institute, Houston. (CD-ROM)  
ALH84001

Koziol A.M. and Brearley A.J. (2002) A non-biological origin for the nanophase magnetite grains in ALH84001: Experimental results (abs#1672). *Lunar Planet. Sci. XXXIII*. Lunar Planetary Institute, Houston. (CD-ROM)  
ALH84001

Koziol A.M. (2003) Magnetite-magnesioferrite phase relations and application to ALH84001 (abs#1128). *Lunar Planet. Sci. XXXIV* Lunar Planetary Institute, Houston  
ALH84001

Koziol A.M. (2004) Experimental determination of siderite stability and application to Martian meteorite ALH 84001. *Am. Mineral.* 89, 294-300.  
ALH84001

Krahenbuhl, U., Noll K., Dobeli M., Grambole D., Herrmann F. and Tobler L. (1999) Exposure of Allan Hills 84001 and other achondrites on the Antarctic ice. *Meteoritics & Planet. Sci.* 33, 665-670.  
ALH84001

Kring D.A., Gleason J.D., Hill D.H., Jull A.J.T. and Boynton W.V. (1996) QUE94201, a new Martian meteorite that may represent a bulk melt rather than a cumulate fraction (abs). *Lunar Planet. Sci. XXVII*, 705-706. Lunar Planetary Institute, Houston. (CD-ROM)  
QUE94201

Kring D.A., Swindle T.D., Gleason J.D. and Grier J.A. (1997) Relative ages of maskelynite and carbonate in ALH84001 and implications for early hydrothermal activity on Mars (abs). In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life.* (eds. Clifford et al.) *LPI Contribution* 916, 46. Lunar Planetary Institute, Houston.  
ALH84001

Kring D.A. and Gleason J.D. (1997) Magmatic temperatures and compositions on early Mars as inferred from the orthopyroxene-silica assemblage in ALH84001 (abs). *Meteoritics & Planet. Sci.* 32, A74.  
ALH84001

Kring D.A., Swindle T.D., Gleason J.D. and Grier J.A. (1998) Formation and relative ages of maskelynite and carbonate in ALH84001. *Geochim. Cosmochim. Acta* 62, 2155-2166.  
ALH84001

Kring D.A. and Gleason J.D. (1999) Sileous igneous rock on Mars (abs#1611). *Lunar Planet. Sci. XXX*, Lunar Planetary Institute, Houston (CD-ROM)  
LEW88516 ALH84001

Kring D.A. (2002) QUE 94201: Reconsidering its origins as a bulk melt from a volcanic region of Mars (abs). Un-mixing SNCs. 31-32. LPI Contribution No. 1134. Lunar Planetary Institute, Houston  
QUE94201

Kring D.A., Gleason J.D., Swindle T.D., Nishiizumi K., Caffee M.W., Hill D.H., Jull A.J.T. and Boynton W.V. (2003) Composition of the first bulk melt sample from a volcanic region on Mars: Queen Alexandra Range 94201. *Meteoritics & Planet. Sci.* 38, 1833-1848.  
QUE94201

Kurat G., Nazarov M.A., Brandstaetter F., Ntaflos T. and Koeberl C. (1997a) Precipitation and reaction products of fluids in Martian orthopyroxenite ALH84001 (abs). *Lunar Planet. Sci. XXVIII*, 775-776. Lunar Planetary Institute, Houston (CD-ROM)  
ALH84001

Kurihara T., Mikouchi T., Saruwatari K., Kameda J., Ari T., Hoffmann V. and Miyamoto M. (2008) Transmission electron microscopy of “brown” color olivines in Martian and Lunar meteorites (abs#2478). *Lunar Planet. Sci. XXXIX* Lunar Planetary Institute, Houston (CD-ROM)  
NWA2737 ALH77005 LEW88516 Y000097

Kurihara T., Mikouchi T., Saruwatari K., Kameda J. and Miyamoto M. (2009) Fe-Ni metal and magnetite nano-particles in “brown” color olivines from Martian meteorites (abs#1049). *Lunar Planet. Sci. XL*, Lunar Planetary Institute, The Woodlands.  
NWA1950 NWA2737

Kubovics I., Kamilla G., Sólymos, Bérczi Sz., Lukács B., Szakmány Gy. and Török K. (1995a) Experimental investigations of ALHA77005 shergottite sample from Antarctica (abs). *NIPR Sym. Antarctic Meteorites* 20th, 130-131. Nat. Inst. Polar Res., Tokyo.  
ALHA77005

Lacroix A. (1927) Mineralogy of Chassigny meteorite. *Bull. Mus. Nat. Hist. (Paris)* 33, 411.  
Chassigny

Lambert P. (1985) Metamorphic record in shergottites (abs). *Meteoritics* 20, 690-691.  
Shergotty

Lambert P. (1987) SNC meteorites: The metamorphic record (abs). *Lunar Planet. Sci. XVIII*, 529-530. Lunar Planetary Institute, Houston.  
Shergotty Nakhla Chassigny

Lambert P. and Grieve R.A.F. (1984) Shock experiments on maskelynite-bearing anorthosite. *Earth Planet. Sci. Lett.* 68, 159-171.  
Shergotty

Lancet M.S. and Lancet K. (1971) Cosmic-ray and gas-retention ages of Chassigny meteorite. *Meteoritics* 6, 81-86.  
Chassigny

Langenhorst F., Stöffler D. and Klein D. (1991) Shock metamorphism of the Zagami achondrite (abs). *Lunar Planet. Sci. XXII*, 779-780. Lunar Planetary Institute, Houston  
Zagami

Langenhorst F. and Greshake A. (1999) A transmission electron microscope study of Chassigny: Evidence for strong shock metamorphism. *Meteoritics & Planet. Sci.* 34, 43-48.  
Chassigny

Langenhorst F., Shaw C.S.J. and Metzler K. (2000) Mineral chemistry and microstructures in ALH84001. (abs#1866). *Lunar Planet. Sci.* XXXI Lunar Planetary Institute, Houston (CD-ROM). ALH84001

Langenhorst F. and Poirier J-P. (2000a) Anatomy of black veins in Zagami: clues to the formation of high-pressure phase. *Earth Planet. Sci. Lett.* 184, 37-55. Zagami

Langenhorst F. and Poirier J-P. (2000b) ‘Eclogitic’ minerals in a shocked basaltic meteorite. *Earth Planet. Sci. Lett.* 176, 259-265. Zagami

Lapen T.J., Brandon A.D., Beard B.L., Peslier A.H., Lee C-T.A. and Dalton H.A. (2008) Lu-Hf age and isotopic systematics of the olivine-phyric shergottite RBT-04262 and implications for the source of enriched shergottites (abs#2073). *Lunar Planet. Sci.* XXXIX. Lunar Planetary Institute, Houston RBT04262

Lapen T.J., Righter M., Brandon A.D., Beard B.L., Shafer J. and Irving A.J. (2009) Lu-Hf isotope systematics of NWA4486 and NWA2990: Implications for the sources of shergottites (abs#2376). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands. NWA4486 NWA2990

Laul J. C. (1986a) The Shergotty consortium and SNC meteorites: An overview. *Geochim. Cosmochim. Acta* 50, 875-888. Shergotty

Laul J.C. (1986b) An overview of the Shergotty consortium studies (abs). *Lunar Planet. Sci.* XVII, 460-461. Lunar Planetary Institute, Houston Shergotty

Laul J.C. (1987) Rare earth patterns in shergottite phosphates and residues. *Proc. Lunar Planet. Sci. Conf. 17th; J. Geophys. Res.* 92 (suppl.), E633-E640. ALHA77005

Laul J.C., Keays R.R., Ganapathy R., Anders E. and Morgan J.W. (1972) Chemical fractionations in meteorites - V. Volatile and siderophile elements in achondrites and ocean ridge basalts. *Geochim. Cosmochim. Acta* 36, 329-345. Nakhla Lafayette Shergotty Zagami

Laul J.C., Smith M. R., Wänke H., Jagoutz E., Dreibus G., Palme H., Spettel B., Burghele A., Lipschutz M. E. and Verkouteren R.M. (1985) Chemical systematics of Shergotty (abs). *Lunar Planet. Sci.* XVI, (suppl. A), 17-18. Lunar Planetary Institute, Houston. Shergotty

Laul J.C., Smith M.R., Wänke H., Jagoutz E., Dreibus G., Palme H., Spettel B., Burghele A., Lipschutz M. E. and Verkouteren R M. (1986) Chemical systematics of the Shergotty meteorite and the composition of its parent body (Mars). *Geochim. Cosmochim. Acta* 50, 909-926. Shergotty

Laul J.C. and Smith M.R. (1986) Rare earth patterns in shergottite phosphates (abs). *Lunar Planet. Sci.* XVII, 464-465. Lunar Planetary Institute, Houston ALHA77005

Lauer H.V., Ming D.W. and Goldin D.C. (2003) Thermal analysis of acicular shaped magnetite (abs#1341). *Lunar Planet. Sci.* XXXIV Lunar Planetary Institute, Houston

ALH84001

- Lee D.-C. and Halliday A.N. (1997a) Hf-W evidence for early differentiation of Mars and the eucrite parent body (abs). *Lunar Planet. Sci.* XXVIII, 795-796. Lunar Planetary Institute, Houston Nakhla Lafayette Shergotty ALH84001 EETA79001
- Lee D.-C. and Halliday A.N. (1997b) Tungsten isotopic constraints on the differentiation of Mars and the Eucrite parent body (abs). *7th Goldschmidt Conf., LPI Contribution* 921, 124. Tucson.
- Lee D.-C. and Halliday A.N. (1997c) Core formation on Mars and differentiated asteroids. *Nature* 388, 854-857.  
Chassigny Nakhla Lafayette Zagami Shergotty ALH84001 EETA79001 ALHA77005
- Lee M.R. and Bland P.A. (2004) Mechanisms of weathering of meteorites recovered from hot and cold deserts and the formation of phyllosilicates. *Geochim. Cosmochim Acta* 68, 893-916.
- Lentz R.C.F. and McSween H.Y. (1999a) Crystal size distributions of the basaltic shergottites (abs#1126). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM)  
Shergotty Zagami EETA79001
- Lentz R.C.F. and McSween H.Y. (1999b) Basaltic shergottite crystallization: A quantitative textural analysis (abs). *Meteoritics & Planet. Sci.* 34, A74.  
Shergotty Zagami EET79001 QUE94201 DaG476
- Lentz R.C.F., Taylor G.J. and Treiman A.H. (1999c) Formation of a Martian pyroxenite: A comparative study of the nakhlite meteorites and Theo's flow. *Meteoritics & Planet. Sci.* 34, 919-932.
- Lentz R.C.F., Ryan J.G., Riciputi L.R. and McSween H.Y. (2000) Water in the Martian mantle: Clues from light lithophile elements in Martian meteorites (abs#1672). *Lunar Planet. Sci.* XXXI Lunar Planetary Institute, Houston (CD-ROM).
- Lentz R.C.F. and McSween H.Y. (2000) Crystallization of the basaltic shergottites: Insights from crystal size distribution (CSD) analysis of pyroxenes. *Meteoritics & Planet. Sci.* 35, 919-927.  
Shergotty Zagami EETA79001 QUE94201 DaG476
- Lentz R.C.F., McSween H.Y., Nazarov M.A. and Taylor L.A. (2001a) A textural consideration of Dhofar 019 with comparisons to other basaltic shergottites (abs#1742). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
Dho019 DaG476 Zagami EETA79001
- Lentz R.C.F. and McSween H.Y. (2001) Small olivines in Dhofar 019: Indications of a complex petrogenesis (abs). *Meteoritics & Planet. Sci.* 36, A111-112.  
Dho019
- Lentz R.C.F., McSween H.Y., Ryan J. and Riciputi L. R. (2001b) Water in Martian magmas: Clues from light lithophile elements in shergottite and nakhlite pyroxenes. *Geochim. Cosmochim. Acta*, 65, 4551-4565.  
Nakhla Lafayette Shergotty Zagami
- Lentz R.C.F. and McCoy T.J. (2002) Insights on mixed basaltic shergottites from a Xenolith-bearing Hawaiian basalt (abs). *Meteoritics & Planet. Sci.* 37, A86.
- Lentz R.C.F. and McSween H.Y. (2003) Crystal size distribution analysis of new nakhlites and Los Angeles: How do they compare with SNCs of old? (abs#1914) *Lunar Planet. Sci.* XXXIV Lunar Planetary Institute, Houston

Lentz R.C.F., McSween H.Y. and Fayeck M. (2004) Light lithophile abundances and isotopic ratios in shergottites (abs#1623). *Lunar Planet. Sci.* XXXV Lunar Planetary Institute, Houston. (CD-ROM)  
QUE94201

Lentz R.C.F., McCoy T.J. and Taylor G.J. (2005a) Multiple nakhlite lava flows? (abs#5298) *Meteoritics & Planet. Sci.* 40, A91.  
MIL03346

Lentz Rachel and McSween Hap (2005b) A textural examination of the Yamato 980459 and Los Angeles shergottites using crystal size distribution analysis. *Antarct. Meteorite Res.* 18, 66-82. Nat. Inst. Polar Res., Tokyo.  
Y980459 Los Angeles

Leroux H., Devouard B., Cordier P. and Guyot F. (2004) Pyroxene microstructures in the Northwest Africa 856 Martian meteorite. *Meteoritics & Planet. Sci.* 39, 711-722.  
NWA856

Leshin L.A. (1997) Sample return and climate: Igneous rocks and impact breccias. In *Mars 2005 sample return workshop*. (ed. Gulick) *LPI Tech. Rpt.* 97-1, 53-56. Lunar Planetary Institute, Houston.

Leshin L.A. (1998a) The origin and evolution of water on Mars: Possible constraints on the Juvenile reservoir (abs#1468). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
QUE94201

Leshin L.A. (1998b) Constraints on Martian volatile history from studies of Martian meteorites: Lessons learned and open questions (abs). *Workshop on the Issue of Martian Meteorites: Where - - - #7046.* Lunar Planetary Institute, Houston.

Leshin L.A. (2000) Insight into martian water resovoirs from analyses of Martian meteorite QUE94201.  
*Geophys. Res. Lett.* 27, 2017-2020.  
QUE94201

Leshin L.A., Epstein S. and Stolper E.M. (1995) The abundance and D/H of water dissolved in EETA79001 shocked glass and crystalline host (abs). *Lunar Planet. Sci.* XXVI, 839-840. Lunar Planetary Institute, Houston  
EETA79001

Leshin L.A., Epstein S. and Stolper E.M. (1996a) Hydrogen isotope geochemistry of SNC (Martian) meteorites and the history of water on Mars (abs). In *Workshop on evolution of Martian volatiles.* (eds. Jakosky and Treiman) *LPI Tech. Rpt.* 96-01, 30-31. Lunar Planetary Institute, Houston.  
ALH84001 Chassigny Nakhla Zagami EETA79001 Shergotty

Leshin L.A., Harvey R.P., McCoy T.J. and McKeegan K.D. (1996b) Water in apatite from shergottite QUE94201: Abundances and D/H (abs). *Meteoritics & Planet. Sci.* 31, A79-A80.  
QUE94201

Leshin L.A., Epstein S. and Stolper E.M. (1996c) Hydrogen isotope geochemistry of SNC meteorites. *Geochim. Cosmochim. Acta* 60, 2635-2650.  
Nakhla Lafayette Governador Valadares Shergotty Zagami EETA79001 ALH84001

Leshin L.A., McKeegan K.D. and Harvey R.P. (1997) Oxygen isotopic constraints on the genesis of carbonates from Martian meteorite ALH84001 (abs). *Lunar Planet. Sci.* XXVIII, 805-806. Lunar Planetary Institute, Houston  
ALH84001

Leshin L.A., McKeegan K.D., Carpenter P.K. and Harvey R.P. (1998) Oxygen isotopic constraints on the genesis of carbonates from Martian meteorite ALH84001. *Geochim. Cosmochim. Acta* 62, 3-13.  
ALH84001

Leshin L.A. (2000) Insights into Martian water reservoirs from analysis of Martian meteorite QUE94201. *Geophys. Res. Lett.* 27, 2017-2020.  
QUE94201

Levsky L.K. and Drubotskoy Y.R. (1988) On the origin of SNC meteorites. *Meteoritika* 47, 134-137.

Lewis C.F., Wrona J.A. and Moore C.B. (1985) *Catalog of meteorites*. Pub. #20 Center for Meteorite Studies. Univ. Arizona, Tempe.  
Nakhla Chassigny Shergotty Lafayette

Lin C-Y., Zhang F-S., Wang H-N., Wang R-C. and Zhang W-L. (2002a) Antarctic GRV99027: A new member of the SNC meteorites (abs#1562). *Lunar Planet. Sci.* XXXIII, Lunar Planetary Institute, Houston. (CD-ROM)  
GRV99027

Lin Y., Ouyan Z., Wang D., Miao B., Lin X., Kimura M. and Jun Y. (2002b) Grove Mountain (GRV) 99027: A new Martian lherzolite (abs). *Meteoritics & Planet. Sci.* 37, A87.  
GRV99027

Lin Y., Wang D., Ouyang Z., Liu X. and Ju. Y. (2003) Grove Mountains (GRV) 99027: A new Martian meteorite. *Chinese Sciences Bulletin* 48, 1771-1774.  
GRV99027

Lin Y., Qi L., Wang Q. and Xu L. (2005a) Major trace and platinum-group elements of the Martian lherzolite Grove Mountains (GRV) 99027 (abs#5154). *Meteoritics & Planet. Sci.* 40, A92.  
GRV99027

Lin Y., Guan Y., Wang D., Kimura M. and Leshin L.A. (2005b) Petrogenesis of the new lherzolitic shergottite Grove Mountains 99027: Constraints of petrography, mineral chemistry, and rare earth elements. *Meteoritics & Planet. Sci.* 40, 1599-1619.  
GRV99027

Lin Y., Qi L., Wang G. and Xu L. (2008) Grove Mountains (GRV) 020090: A high fractionated lherzolitic shergottite. *Meteoritics & Planet. Sci.* 43, A86.  
GRV020090

Lin Y., Liu T., Shen W., Xu L. and Miao B. (2008) Bulk composition of lherzolitic shergottite Grove Mountains 99027: Constraints on the mantle of Mars. *Meteoritics & Planet. Sci.* 43, 1179-1187.  
GRV99027

Lindstrom D.J. (1991) Microprobe studies of microtomed particles of “white druse” salts in shergottite EETA79001 (abs). *Meteoritics* 26, 365.  
EETA79001

Lindstrom D.J. and Martinez R.R. (1991) Trace element analysis by INAA of possible Martian weathering products in shergottite EETA79001 (abs). *Lunar Planet. Sci.* XXII, 813-814. Lunar Planetary Institute, Houston.  
EETA79001

Lindstrom D.J., Treiman A.H. and Martinez R.R. (1993) Trace-element analysis of magmatic inclusions in

ALHA77005 by micro-INAA (abs). *Meteoritics* 28, 386-387.  
ALHA77005

Lindstrom D.J., Treiman A.H. and Martinez R.R. (1996) Trace-element geochemistry of Martian weathering products in Lafayette (abs). In *Workshop on evolution of Martian volatiles*. (eds. Jakosky and Treiman) *LPI Tech. Rpt.* 96-01, 31-32. Lunar Planetary Institute, Houston.  
Lafayette

Lindstrom M.M., Mittlefehldt D.W., Treiman A.H., Wentworth S.J., Gooding J.L., Keller L.P. and McKay G. A. (1992) LEW88516: A new shergottite from Antarctica (abs). *Lunar Planet Sci.* XXIII, 783-784. Lunar Planetary Institute, Houston  
LEW88516

Lindstrom M.M., Treiman A.H. and Mittlefehldt D. W. (1994) Pigeonholing planetary meteorites: The lesson of misclassification of EET87521 and ALH84001 (abs). *Lunar Planet. Sci.* XXV, 797-798. Lunar Planetary Institute, Houston  
ALH84001

Lindstrom M.M. (1999) Lunar and Martian meteorites: Suites, pairing and implications (abs). *NIPR Sym. Antarctic Meteorites* 24th, 90-92. Nat. Inst. Polar Res., Tokyo.

Lipschutz M.E. (1982) Weathering effects in Antarctic Meteorites. In *Catalog of meteorites from Victoria Land, Antarctica 1978-1980*. (eds. Marvin and MacPherson) *Smithson. Contrib. Earth Sci.* 24, 67-69. Washington, DC.

Lipschutz M.E. and Cassidy W.A. (1986) Antarctic meteorites: A progress report. *EOS* 67, 1339-1341.

Liu J-Z., Zou Y-L., Li C-L. and Ouyang Z-Y. (2004) A study on the recovery and classification of meteorites from the Mt. Grove region of Antarctica. *Chin. J. Astron. Astrophys.* Vol. 4, 166-175.  
GRV99027

Lodders K. (1998) A survey of shergottite, nakhlite and chassigny meteorites whole-rock compositions. *Meteoritics & Planet. Sci.* 33, A183-190.

Lodders K. and Fegley B. (1997) An oxygen isotope model for the composition of Mars. *Icarus* 126, 373-394.

Lodders K. and Fegley B. (1998) *The Planetary Scientist's Companion*. Oxford University Press, NY.

Lofgren G. E. and many authors (1981) Petrology and chemistry of terrestrial, lunar and meteoritic basalts. In *Basaltic Volcanism on the Terrestrial Planets*, 1-437. Pergamon Press.  
Shergotty

Longhi J. (1982) Modeling high pressure partial melting of the Martian mantle (abs). *Lunar Planet. Sci.* XIII, 445-446. Lunar Planetary Institute, Houston

Longhi J. (1990) Magmatic processes on Mars: Insights from SNC meteorites (abs). *Lunar Planet. Sci.* XXI, 716-717. Lunar Planetary Institute, Houston

Longhi J. (1991) Complex magmatic processes on Mars: Inferences from the SNC meteorites. *Proc. Lunar Planet. Sci. Conf.* 21<sup>st</sup> 695-709. Lunar Planetary Institute, Houston.

Longhi J. (1992) Volatiles in SNC petrogenesis: A Sr signal? (abs) *Lunar Planet. Sci.* XXIII, 805-806. Lunar Planetary Institute, Houston

- Longhi J. (1997) What the SNC meteorites tell us about Mars. In *Mars 2005 sample return workshop*. (ed. Gulick) *LPI Tech. Rpt.* 97-1, 64-68. Lunar Planetary Institute, Houston.
- Longhi J. (2002) SNC meteorites and their source compositions (abs). Un-mixing SNCs. 33-34. LPI Contribution No. 1134. Lunar Planetary Institute, Houston
- Longhi J. and Pan V. (1987) What SNC meteorites tell us about Martian magmatism (abs). In *MEVTW workshop on nature and composition of surface units on Mars*. *LPI Tech. Rpt.* 87-0, 76-78. Lunar Planetary Institute, Houston.
- Longhi J. and Pan V. (1988) The parent magmas of the SNC meteorites (abs). *Lunar Planet. Sci. XIX*, 690-691. Lunar Planetary Institute, Houston
- Longhi J. and Pan V. (1989) The parent magmas of the SNC meteorites. *Proc. Lunar Planet. Sci. Conf.* 19th, 451-464. Lunar Planetary Institute, Houston.
- Longhi J., Knittle E., Holloway J. R. and Wänke H. (1992) The bulk composition, mineralogy and internal structure of Mars. In *Mars* (eds. Kieffer *et al.*), 185-208. Univ. Arizona Press, Tucson.
- Lorand J-P., Chevrier V. and Viola Sautter (2005) Sulfide mineralogy and redox conditions in some shergottites. *Meteoritics & Planet. Sci.* 40, 1257-1272.  
DaG476 SaU005 Zagami Shergotty Los Angeles NWA480
- Ludwig E. (1871) Analysis of Shergotty meteorite. *Tschermaks Min. Pet. Mitt.* p55.  
Shergotty
- Lundberg L.L., Crozaz G., Zinner E. and McKay G.A. (1986) The REE carriers in the Shergotty meteorite (abs). *Meteoritics* 21, 437-438.  
Shergotty
- Lundberg L.L., Crozaz G. and McSween H.Y. (1987) Allan Hills 77005: In-situ rare earth element analysis by secondary ion mass spectroscopy (abs). *Meteoritics* 22, 447-449.  
ALHA77005
- Lundberg L.L., Crozaz G., McKay G.A. and Zinner E. (1988) Rare earth element carriers in the Shergotty meteorite and implications for its chronology. *Geochim. Cosmochim. Acta* 52, 2147-2163.  
Shergotty
- Lundberg L.L., Crozaz G. and McSween H.Y. (1990) Rare earth elements in minerals of the ALHA77005 shergottite and implications for its parent magma and crystallization history. *Geochim. Cosmochim. Acta* 54, 2535-2547.  
ALHA77005
- Lugmair G.W., Shukolyukov A. and MacIsaac Ch. (1996) Radial heterogeneity of  $^{53}\text{Mn}$  in the early solar system and the place of origin of the ordinary chondrites (abs). *Lunar Planet. Sci. XXVII*, 785-786.  
Lunar Planetary Institute, Houston  
Shergotty ALH84001
- Lugmair G.W. and Shukolyukov A. (1998) Early solar system timescales according to  $^{53}\text{Mn}$ - $^{53}\text{Cr}$  systematics. *Geochim. Cosmochim. Acta* 62, 2863-2886.  
ALH84001 Shergotty EETA79001
- Ma M.-S., Schmitt R.A. and Laul J.C. (1980) Genetic relationship between Allan Hills 77005 and shergottites - A geochemical study (abs). *Meteoritics* 15, 327.  
ALHA77005

Ma M.-S., Laul J.C. and Schmitt R.A. (1981) Complementary rare earth element patterns in unique achondrites, such as ALHA77005 and shergottites, and in the Earth. *Proc. Lunar Planet. Sci. Conf.* 12th, 1349-1358.  
ALHA77005

Ma M.-S., Laul J.C., Smith M.R. and Schmitt R.A. (1982) Chemistry of shergottites Elephant Moraine A79001 and Zagami (abs). *Lunar Planet. Sci.* XIII, 451-452. Lunar Planetary Institute, Houston EETA79001 Zagami

MacPherson G. (2001) The first returned Martian samples: Science objectives. In *Science Planning for Exploring Mars.* JPL 01-7

Madsen M.B., Olsen M., Knudsen J.M., Petersen D. and Vistisen L. (1992) The ferrimagnetic phase in Nakhla and Zagami - implications for the Martian fines (abs). *Lunar Planet. Sci.* XXIII, 825-826. Lunar Planetary Institute, Houston  
Nakhla Zagami

Makishima J., McKay G., Le L., Miyamoto M. and Mikouchi T. (2006) Calibration of the Eu oxybarometer for nakhlites (abs#1589). *Lunar Planet. Sci. Conf.* XXXVII Lunar Planetary Institute, Houston

Makishima J., McKay G., Le L., Miyamoto M. and Mikouchi T. (2006) Aluminium effects on the calibration of the Eu oxybarometer for nakhlites (abs). *Antarctic Meteorites* XXX, 52-53. Nat. Inst. Polar Res., Tokyo

Malavergne V., Guyot F., Benzerara K. and Martinez I. (2002) Descriptions of new shock-induced phases in the Shergotty, Zagami, Nakhla and Chassigny meteorites. *Meteoritics & Planet. Sci.* 36, 1297-1305.  
Shergotty Zagami Nakhla Chassigny

Marakushev A.A. and Bobrov A.V. (1999) Origin of ALH84001 Antarctic meteorite (abs). *NIPR Sym. Antarctic Meteorites* XXIII, 66-67. Nat. Inst. Polar Res., Tokyo.  
ALH84001

Marti Kurt, Kim J.S., Thakur A.N., McCoy T.J. and Keil K. (1995) Signatures of the Martian atmosphere in glass of the Zagami meteorite. *Science* 267, 1981-1984.  
Zagami

Marti K. and Mathew K.J. (1998) Relations among solar system Xenon reservoirs and the Chassigny connection (abs#1841). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
Chassigny

Marti K., Geddes K., Mathew K.J. and Weigel A. (1999) Searches for signatures of the early atmospheres of Mars and Earth (abs). *Meteoritics & Planet. Sci.* 34, A77.

Marti K. and Mathew K.J. (2000a) Meteoritic and solar isotopic signatures in volatiles on early Mars. (abs). *Meteoritics & Planet. Sci.* 35, A103.  
Chassigny ALH84001

Marti K. and Mathew K.J. (2000b) Ancient Martian nitrogen. *Geophys. Res. Lett.* 27, 1463-1466.

Marti K., Marty B. and Mathew K.J. (2001) Martian interior volatiles: Indigenous signatures and early evolution (abs). *Meteoritics & Planet. Sci.* 36, A122.

- Marti K., Mathew K.J. and Marty B. (2003) Martian xenology: Indigenous. Radiogenic and fission components (abs #1816). *Lunar Planet. Sci. Conf.* 34<sup>th</sup>, Lunar Planetary Institute, Houston (CD-ROM).
- Marti K. and Mathew K.J. (2004) Martian mantle signatures in Yamato nakhlites. *Antarctic Meteorite Research* 17, 117-131. Nat. Inst. Polar Res., Tokyo.
- Martinez R. and Gooding J.L. (1986) New saw-cut surfaces of EETA79001. *Antarctic Meteorite Newsletter* 9 (1), 23. JSC Curator's Office, Houston.  
EETA79001
- Marty B., Zimmermann L. and Pik R. (1998) Nitrogen and argon isotopes in individual mineral grains of SNC meteorites: A CO<sub>2</sub>-laser step-heating analysis (abs#1672). *Lunar Planet. Sci. XXIX* Lunar Planetary Institute, Houston (CD-ROM).  
Nakhla Chassigny Zagami
- Marty B., Marti K. and Th. Monod Consortium (2001) Noble gases in new SNC meteorites NWA817 and NWA 480. *Meteoritics & Planet. Sci.* 36, A122-123.  
NWA480 NWA817
- Marty B. and Marti K. (2002) Signatures of early differentiation of Mars. *Earth Planet. Sci. Lett.* 196, 251-263.  
NWA817 Chassigny ALH84001 Nakhla
- Marty B., Mathew K.J. and Marti K. (2002) Martian xenology (abs). 12<sup>th</sup> Goldschmidt Conf. *Geochim. Cosmochim. Acta* 66, A490.
- Marty B., Mathew K.J. and Marti K. (2003) Noble gases in newly discovered SNC: Insights into the evolution of Mars and comparison with Earth (abs). International Symposium. *Evolution of Solar System: A New Perspective from Antarctic Meteorites*, 71-72. Nat. Inst. Polar Res., Tokyo.  
NWA817 NWA480 NWA856 NWA1068
- Marty B., Grimberg A., Heber V.S. and Wieler R. (2005) Noble gases in the newly found NWA2737 Chassignite (abs#5175). *Meteoritics & Planet. Sci.* 40, A98.  
NWA2737
- Marty B., Heber V.S., Grimberg A., Weiler R. and Barrat J-A. (2008) Noble gases in the Martina meteorite Northwest Africa 2737: A new chassignite signature. *Meteorit. Planet. Sci.* 41, 739-748.  
NWA2737
- Marvin Ursala B. (1997) Procedures adopted for allocating samples of ALH 84001 and other Antarctic meteorites for research into life on Mars. MMWG, JSC Curator's Office, Houston.
- Masarik J. and Reedy R.C. (1995) Production of cosmogenic nuclides in SNC meteorites in the Martian surface (abs). *Lunar Planet. Sci. XXVI*, 901-902. Lunar Planetary Institute, Houston
- Mason Brian (1962) *Meteorites*. J. Wiley, New York, 274pp.
- Mason B. (1978) ALHA77005. *Antarctic Meteorite Newsletter* 1(2), 9 and 1(3). JSC Curator's Office, Houston.  
ALHA77005
- Mason B. (1979) *Meteorites*. In *Data of Geochemistry, Chapter B, Part 1. USGS Prof. Paper* 440-B-1, B117-120.  
Nakhla Chassigny

Mason B. (1981) ALHA77005 petrographic description. *Antarctic Meteorite Newsletter* 4(1), 12. JSC Curator's Office, Houston.  
ALHA77005

Mason B., Nelen J.A., Nuir P. and Taylor S.R. (1975) The composition of the Chassigny meteorite. *Meteoritics* 11, 21-27.  
Chassigny

Mason B., Jarosewich E. and Nelen J.A. (1979) The pyroxene-plagioclase achondrites. *Smithson. Contrib. Earth Sci.* 22, 27-45. Washington, DC.  
Shergotty

Mason B., MacPherson G.J., Score R., Martinez R., Satterwhite C., Schwarz C. and Gooding J.L. (1992) Descriptions of Stony Meteorites. In *Field and laboratory investigations of Antarctic meteorites collected by the United States expeditions 1985-1987. (eds. Marvin and MacPherson)* *Smithson. Contrib. Earth Sci.* 30, 17-35. Washington, DC.  
ALH84001

Mathew K.J., Kim J.S. and Marti K. (1997) Xenon components in Martian meteorites: Evidence for atmospheric evolution? (abs) *Lunar Planet. Sci.* XXVIII, 885-886. Lunar Planetary Institute, Houston  
ALH84001 EETA79001 Zagami

Mathew K.J. and Marti K. (1998a) Nitrogen and noble gas isotopic signatures in bulk ALH84001 with carbonates (abs#1825). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Mathew K.J. and Marti K. (1998b) Signatures of noble gases and nitrogen in the atmosphere and interior of Mars (abs). *Meteoritics & Planet. Sci.* 33, A99-100.

Mathew K.J. and Marti K. (1999a) Nitrogen and xenon isotopic signatures in SNC'S and the interior of Mars (abs#1418). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM)  
Chassigny

Mathew K.J., Kim J.S. and Marti K. (1999b) Martian atmospheric and indigenous components of xenon and nitrogen in the Shergotty, Nakhla and Chassigny group meteorites. *Meteoritics & Planet. Sci.* 33, 655-664.  
Shergotty Nakhla Chassigny Zagami ALH84001 EET79001

Mathew K.J. and Marti K. (2001a) Nitrogen and noble gass signatures in Nakhla: Identification of primitive and evolved components (abs#1214). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
Nakhla

Mathew K.J. and Marti K. (2001b) Early evolution of Martian volatiles: Nitrogen and noble gas components in ALH84001 and Chassigny. *J. Geophys. Res.* 106, 1401-1422.  
ALH84001 Chassigny

Mathew K.J., Marti K. and Marty B. (2002) Fission xenon on Mars (abs#1427). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)  
NWA817 ALH84001 Nakhla Chassigny

Mathew K.J. and Marti K. (2002a) Martian atmospheric and interior volatiles in the meteorite Nakhla. *Earth Planet. Sci. Lett.* 199, 7-20.

Nakhla

- Mathew K.J. and Marti K. (2002b) Nitrogen, Ar, and Xe in Martian meteorites: clues to the evolution of interior gas components (abs). *Antarctic Meteorites XXVII*, 77-78. Nat. Inst. Polar Res., Tokyo.
- Mathew K.J., Marty B., Marti K. and Zimmermann L. (2003) Volatiles (nitrogen, noble gases) in recently discovered SNC meteorites, extinct radioactivities and evolution. *Earth Planet. Sci. Lett.* 214, 27-42.
- Mathew K.J. and Marti K. (2005) Evolutionary trends in volatiles of the nakhelite source region of Mars. *J. Geophys. Res.* 110, E12S05
- Mautner M.N. and Sinaj S. (2002) Water-extractable and exchangeable phosphate in Martian and carbonaceous chondrite meteorites and in planetary soil analogs. *Geochim. Cosmochim. Acta* 66, 3161-3174.  
Nakhla DaG476 EETA79001
- Mayeda T.K., Yanai K. and Clayton R.N. (1995) Another Martian meteorite (abs). *Lunar Planet. Sci.* XXVI, 917-918. Lunar Planetary Institute, Houston  
Y793605
- McAdam A.C., Leshin L.A. and Harvey R.P. (2002) Investigation of weathering products of Martian meteorite analog materials on Earth and applications to Martian dust (abs). *Meteoritics & Planet. Sci.* 37, A96.
- McBride K.M. (2001) More Martian meteorites from Antarctica? A comparison of Antarctic meteorite abundances with falls (abs). *Meteoritics & Planet. Sci.* 36, A128.
- McBride K.M., Righter K., Satterwhite C.E., Schwarz C. and Robinson P. (2005) Curation and allocation of the new Antarctic Nakhelite MIL03346 (abs#1499). *Lunar Planet. Sci. XXXVI* Lunar Planetary Institute, Houston. (CD-ROM)  
MIL03346
- McCanta M.C. and Rutherford M.J. (2001) SNC oxygen fugacity as recorded in pyroxenes: An experimental study (abs#1348). *Lunar Planet. Sci. XXXII* Lunar Planetary Institute, Houston.  
(CD-ROM)  
QUE94201 Shergotty
- McCanta M.C., Rutherford M.J. and Jones J.H. (2002a) An experimental study of Eu/Gd partitioning between a shergottite melt and pigeonite: Implications for the oxygen fugacity of the Martian interior (abs#1942). *Lunar Planet. Sci. XXXIII* Lunar Planetary Institute, Houston. (CD-ROM)
- McCanta M.C., Rutherford M.J. and Musselwhite D.S. (2002b) An experimental study of REE partitioning between a dry shergottite melt and pigeonite as a function of fO<sub>2</sub>: Implications for the Martian interior (abs). *Meteoritics & Planet. Sci.* 37, A97.
- McCanta M.C. and Rutherford M.J. (2002) Oxygen fugacity recorded in pigeonite: Indications of a heterogeneous Martian magma source region? (abs) Un-mixing SNCs. 35-36. LPI Contribution No. 1134. Lunar Planetary Institute, Houston
- McCanta M.C., Rutherford M.J., Dyar M.D. and Delaney J.S. (2003) Fe<sup>+3</sup>/Fe ratios in pigeonite as a function of fO<sub>2</sub>: A preliminary investigation (abs #1361). *Lunar Planet. Sci. XXXIV* Lunar Planetary Institute, Houston (CD-ROM).
- McCanta M.C., Rutherford M.J. and Jones J.H. (2004) An experimental study of rare earth element partitioning between a shergottite melt and pigeonite: implications for the oxygen fugacity of the

- Martian  
interior. *Geochim. Cosmochim. Acta* 68, 1943-1952.
- McCanta M.C., Rutherford M.J. and Calvin C. (2005) Melt REE contents of lherzolitic shergottite ALH77005 and nakhelite MIL03346: Application of the Eu-oxybarometer (abs#5249). *Meteoritics & Planet. Sci.* 40, A99.  
ALH77005 MIL03346
- McCanta M.C., Dyar M.D., Treiman A.H., Pieters C.M., Hiroi T., Lane M.D. and Bishop J.L. (2006) Mossbauer and synchrotron microxanes analysis of NWA2737 (abs#1751). *Lunar Planet. Sci.* XXXVII Lunar Planetary Institute, Houston  
NWA2737
- McCarthy T.S., Erlank A.J., Willis J.P. and Ahrens L.H. (1974) New chemical analyses of six achondrites and one chondrite. *Meteoritics* 9, 215-222.  
Shergotty Chassigny
- McCleanse D. (2001) The search for evidence of life on Mars. In Science Planning for Exploring Mars.  
JPL 01-7
- McCollum T.M. (2003) Formation of meteoritic hydrocarbons from thermal decomposition of siderite ( $\text{FeCO}_3$ ). *Geochim. Cosmochim. Acta* 67, 311-317.  
ALH84001
- McCoy T.J., Taylor G.J., Keil K. and Noll P.D. (1991) Zagami: Product of a two-stage magmatic history (abs). *Lunar Planet. Sci.* XXII, 867-868. Lunar Planetary Institute, Houston  
Zagami
- McCoy T.J., Taylor G.J. and Keil K. (1992) Zagami: Product of a two-stage magmatic history. *Geochim. Cosmochim. Acta* 56, 3571-3582.  
Zagami
- McCoy T.J., Keil K. and Taylor G.J. (1993) The dregs of crystallization in Zagami (abs). *Lunar Planet. Sci.* XXIV, 947-948. Lunar Planetary Institute, Houston  
Zagami
- McCoy T.J., Wadhwa M. and Keil K. (1995) Zagami: another new lithology and a complex near-surface magmatic history (abs). *Lunar Planet. Sci.* XXVI, 925-926. Lunar Planetary Institute, Houston  
Zagami
- McCoy T.J. and Lofgren G.E. (1996) The crystallization of the Zagami shergottite: A 1 atm. experimental study (abs). *Lunar Planet. Sci.* XXVII, 839-840. Lunar Planetary Institute, Houston  
Zagami
- McCoy T.J., Wadhwa M. and Keil K. (1997) New lithologies in the Zagami meteorite: Evidence for fractional crystallization of a single magma unit on Mars. *Geochim. Cosmochim. Acta* 63, 1249-1262.  
Zagami
- McCoy T.J. and Lofgren G.E. (1999) Crystallization of the Zagami shergottite: an experimental study. *Earth Planet. Sci. Lett.* 173, 397-411.  
Zagami
- McCubbin F.M., Whitaker M.L., Lindsley D.H. and Nekvasil H. (2005) Kaersutite (Ti-rich amphibole) in the SNC meteorites: Can it crystallize at low pressure? (abs#1967) *Lunar Planet. Sci.* XXXVI Lunar Planetary Institute, Houston. (CD-ROM)

McCubbin F.M., Nekvasil H. and Lindsley D.H. (2006) Apatite as a key to evaluating the volatile budget of Martian magmas: Implications from the Chassigny meteorite (abs#1098). *Lunar Planet. Sci.* XXXVII Lunar Planetary Institute, Houston  
Chassigny

McCubbin F.M., Tosca N.J., Smirnov A., Nekvasil H., Fries M. and Steele A. (2008) Jarosite in a clinopyroxene-hosted melt inclusion from Martian meteorite MIL03346: Evidence for hydrothermal formation by sulfide oxidation (abs#1982). *Lunar Planet. Sci.* XXXIX Lunar Planetary Institute, Houston  
MIL03346

McCubbin F.M. and Nekvasil H. (2008) *Am. Mineral.* 93, 676

McCubbin et al. (2009) Hydrous magmatism (abs#2207). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.

McDonald G.D. and Bada J.L. (1995) A search for endogenous amino acids in the Martian meteorite EETA79001. *Geochim. Cosmochim. Acta* 59, 1179-1184.  
EETA79001

McElroy M.B., Yung Y.L. and Nier A.O.C. (1976) Isotopic composition of nitrogen: Implications for the past history of Mars' atmosphere. *Science* 194, 70-72.

McEwen A., Turtle E., Burr D., Milazzo M., Lanagan P., Christensen P. and Boyce J. (2003) Discovery of a large rayed crater on Mars: Implications for recent volcanic and fluvial activity and the origin of Martian meteorites (abs#2040). *Lunar Planet. Sci. Conf.* XXXIV Lunar Planetary Institute, Houston (CD-ROM).

McFadden Lucy A. (1987) Spectral reflectance of SNC meteorites: Relationships to Martian surface composition. *MEVT workshop on nature and composition of surface of Mars (and whether wine can be made)*. *LPI Tech. Rpt.* 88-05, 88-90. (eds. Zimbelman et al.) Lunar Planetary Institute, Napa Valley.  
Shergotty Nakhla Chassigny ALHA77005

McFadden L.A. and Pratt S.F. (1989) Remote sensing and the Shergottite-Nakhlite-Chassignite meteorite parent body (abs). *Bull. Am. Astron. Soc.* 21, 967.  
Shergotty Nakhla Chassigny ALHA77005

McHone J.F., Kudryavtsev A.B., Agresti D.G., Wdowiak T.J. and Killgore M. (1999) Raman imagery of Martian meteorites (abs#1896). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM)  
Nakhla Zagami DaG476

McKay Dave S. (1998) Evidence for ancient life in Mars meteorites: Lessons learned (abs). *Workshop on the Issue Martian Meteorites: Where - - - #7050*. Lunar Planetary Institute, Houston.

McKay D.S., Gibson Everet K., Thomas-Keprrta, K.L., Vali H., Romanek C.S., Clemett S.J., Chillier X.D.F., Maechling C.R. and Zare R.N. (1996a) Search for life on Mars: Possible relic biogenic activity in Martian meteorite ALH84001. *Science* 273, 924-930.  
ALH84001

McKay D.S., Thomas-Keprrta Kathy L., Romanek C.S., Gibson E.K. and Vali H. (1996b) Evaluating the evidence for past life on Mars: Response. *Science* 274, 2123-2124.  
ALH84001

McKay D.S., Gibson E.K., Thomas-Keprta K.L., Romanek Cris S. and Allen C.C. (1997a) Possible biofilms in ALH84001 (abs). *Lunar Planet. Sci.* XXVIII, 919-920. Lunar Planetary Institute, Houston.  
ALH84001

McKay D.S., Gibson E.K., Thomas-Keprta K.L. and Vali H. (1997b) Reply to Bradley *et al.* (1997). *Nature* 390, 455.  
ALH84001

McKay D.S., Wentworth Sue W., Thomas-Keprta K.L., Westall F. and Gibson E.K. (1999) Possible bacteria in Nakhla (abs#1816). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM)  
Nakhla

McKay D.S., Wentworth S.W., Longazo T.G., Thomas-Keprta K. and Gibson E.K. (2001) Textures of secondary alteration zones in Nakhla (abs#2040). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
Nakhla

McKay D.S., Clemett Steve J., Gibson E.K., Thomas-Keprta K. and Wentworth S.J. (2002) Are carbonate globules, magnetites and PAHs in ALH84001 really terrestrial contaminants? (abs#1943). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)  
ALH84001

McKay D.S., Rao M.N., Thomas-Keprta K.L., Wentworth S.J., Clemett S. and Gibson E.K. (2003) Complex chemical weathering revealed in Martian meteorite EET79001, and implications for life (abs). International Symposium. *Evolution of Solar System: A New Perspective from Antarctic Meteorites*, 74-75. Nat. Inst. Polar Res., Tokyo.  
EETA79001

McKay D.S. and 9 authors (2006) Observation and analysis of *In Situ* carbonaceous matter in Nakhla: Part I (abs#2251). *Lunar Planet. Sci. Conf.* XXXVII Lunar Planetary Institute, Houston  
Nakhla

McKay Gorden A. (1993) Minor elements in Nakhla cumulus pyroxenes (abs). *Meteoritics* 28, 395-396.  
Nakhla

McKay G.A., Yang S.-R. and Wagstaff J. (1985) Minor phases, Fe-rich pyroxene and Shergotty chronology. *Meteoritics* 20, 710-711.  
Shergotty

McKay G.A. and Wagstaff J. (1985) Clinopyroxene REE distribution coefficients for shergottites: REE content of the Shergotty/Zagami melts (abs). *Lunar Planet. Sci.* XVI, 540-541. Lunar Planetary Institute, Houston  
Shergotty, Zagami

McKay G.A., Wagstaff J. and Yang S.-R. (1986a) Whitlockite/melt partitioning and Shergotty chronology (abs). *Meteoritics* 21, 448-449.  
Shergotty

McKay G.A., Wagstaff J. and Yang S.-R. (1986b) Clinopyroxene REE distribution coefficients for shergottites: The REE content of the Shergotty melt. *Geochim. Cosmochim. Acta* 50, 927-937.  
Shergotty

McKay G.A., Wagstaff J. and Le L. (1986c) Pyroxene distribution coefficients, the Shergotty parent melt and metasomatic alteration (abs). *Lunar Planet. Sci.* XVII, 537-538. Lunar Planetary Institute, Houston  
Shergotty

McKay G.A. and Wagstaff J. (1987) Metasomatic alteration of Shergotty? Evidence from petrographic and phase compositions (abs). *Meteoritics* 22, 456-457.  
Shergotty

McKay G.A., Wagstaff J., Le L., Lindstrom D.J. and Colson R. (1987) Whitlockite/melt partitioning and Henry's law: Shergotty late-stage minerals (abs). *Lunar Planet. Sci.* XVIII, 625-626. Lunar Planetary Institute, Houston  
Shergotty

McKay G.A., Le L. and Wagstaff J. (1992) REE partition coefficients for the Nakhla parent melt (abs). *Lunar Planet. Sci.* XXIII, 889-890. Lunar Planetary Institute, Houston  
Nakhla

McKay G.A., Le L. and Wagstaff J. (1993) The Nakhla parent melt: REE partition coefficients and clues to major element composition (abs). *Lunar Planet. Sci.* XXIV, 965-966. Lunar Planetary Institute, Houston  
Nakhla

McKay G.A., Le L. and Wagstaff J. (1994) Synthetic and natural Nakhla pyroxenes: Parent melt composition and REE partition coefficients (abs). *Lunar Planet. Sci.* XXV, 883-884. Lunar Planetary Institute, Houston  
Nakhla

McKay G.A., Yang S.-R. and Wagstaff J. (1996) Complex zoned pyroxenes in shergottite QUE94201: Evidence for a two-stage crystallization history (abs). *Lunar Planet. Sci.* XXVII, 851-852. Lunar Planetary Institute, Houston  
QUE94201

McKay G.A. and Lofgren G.E. (1997) Carbonates in ALH84001: Evidence for kinetically controlled growth (abs). *Lunar Planet. Sci.* XXVII, 921-922. Lunar Planetary Institute, Houston  
ALH84001

McKay G.A., Mikouchi T. and Lofgren G.E. (1997a) Carbonates and feldspathic glass in Allan Hills 84001: Additional complications (abs). *Meteoritics & Planet. Sci.* 32, A87-88.  
ALH84001

McKay G.A., Lofgren G.E. and Mikouchi T. (1997b) Textural relationships among carbonates, shocked feldspathic glass and pyroxene in Martian meteorite ALH84001 (abs). *NIPR Sym. Antarctic Meteorites* 22nd, 106-108. Nat. Inst. Polar Res., Tokyo.  
ALH84001

McKay G.A., Mikouchi T., Schwandt C S. and Lofgren G. (1998a) Fracture fillings in ALH84001 feldspathic glass: Carbonates and silica (abs). *Lunar Planet. Sci.* XXIX #1944, Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

McKay G.A., Schwandt C.S. and Mikouchi T. (1998b) Feldspathic glass and silica in ALH84001 (abs). *Meteoritics & Planet. Sci.* 33, A102.  
ALH84001

McKay G.A., Schwandt C.S. and Mikouchi T. (1998c) Additional petrographic features of Martian meteorite of Martian meteorite ALH84001 (abs). *NIPR Sym. Antarctic Meteorites* 23rd, 75-76. Nat. Inst. Polar Res., Tokyo.  
ALH84001

McKay G.A., Mikouchi T., Le L., Schwandt C. and Hashimoto M. (2000) The Shergotty paradox: An experimental perspective on intercumulus melt compositions (abs). *Lunar Planet. Sci. XXXI*, #2000. Lunar Planetary Institute, Houston (CD-ROM).

McKay G.A., Koizumi E., Mikouchi T., Le L. and Schwandt C. (2001) Experimental crystallization of the QUE94201 basaltic shergottite: Support for the Martian magma hypothesis (abs). *NIPR Sym. Antarctic Meteorites* 24th, 77-79. Nat. Inst. Polar Res., Tokyo.  
QUE94201

McKay G.A., Koizumi E., Mikouchi T., Le L. and Schwandt C. (2002a) Crystallization of shergottite QUE94201: An experimental study (abs#2051). *Lunar Planet. Sci. XXXIII* Lunar Planetary Institute, Houston. (CD-ROM)  
QUE94201

McKay G.A., Koizumi E., Mikouchi T., Le L. and Schwandt C. (2002b) Experimental crystallization of shergottite QUE94201: A Martian magma (abs). *Antarctic Meteorites XXVII*, 80-82. Nat. Inst. Polar Res., Tokyo.

McKay G.A., Le L., Koizumi E. and Mikouchi T. (2003) Additional constraints on the crystallization of basaltic shergottite QUE94201 (abs#2109). *Lunar Planet. Sci. XXXIV* Lunar Planetary Institute, Houston  
QUE94201

McKay G.A. and Mikouchi T. (2003) Crystallization of Antarctic shergottite Yamato 980459. (abs) International Symposium. *Evolution of Solar System: A New Perspective from Antarctic Meteorites*, 76-77. Nat. Inst. Polar Res., Tokyo.  
Y980459

McKay G.A., Le L., Schwandt C., Mikouchi T. and Koizumi E. (2004) Redox state and petrogenesis of Martian basalts: Clues from experimental petrology (abs). *Ant. Met. XXVIII*, Nat. Inst. Polar Res., Tokyo.

McKay G.A., Le L., Schwandt C., Mikouchi T., Koizumi E. and Jones J. (2004) Yamato 980459: The most primitive shergottite? (abs#2154) *Lunar Planet. Sci. XXXV* Planetary Institute, Houston. (CD-ROM)  
Y980459

McKay G.A. and Schwandt C. (2005) Mineralogy and petrology of the new Antarctic Nakhelite MIL03346 (abs#2351). *Lunar Planet. Sci. XXXVI* Lunar Planetary Institute, Houston. (CD-ROM)  
MIL03346

McKay G.A. and Mikouchi T. (2005) Minor element zoning in Nakhellites: What's going on? (abs#5335) *Meteoritics & Planet. Sci.* 40, A100.  
MIL03346

McKay G., Mikouchi T. and Schwandt C. (2006) Additional complexities in nakhelite pyroxenes: A progress (?) report ! (abs#2435) *Lunar Planet. Sci. Conf. XXXVII* Lunar Planetary Institute, Houston. (CD-ROM)  
MIL003346 Y000593

McKay G., Schwandt C., Le L., Makishima J., Mikouchi T. and Kurihara T. (2006) Minor elements in Naklite Pyroxenes: Cr in MIL00346 (abs). *Antarctic Meteorites XXX*, 59-60. Nat. Inst. Polar Res., Tokyo.  
MIL003346

McLennan S.M. (2003) Evidence for a distinctive rare earth element-enriched mantle reservoir on Mars (abs #1710). *Lunar Planet. Sci. Conf. XXXIV* Lunar Planetary Institute, Houston (CD-ROM).

McSween H.Y. (1982a) Igneous layering and shock metamorphism in a new Antarctic achondrite (abs). *NIPR Sym. Antarctic Meteorites* 7th, 24-25. Nat. Inst. Polar Res., Tokyo.  
EETA79001

McSween H.Y. (1982b) An example of igneous layering on a meteorite parent body. In *Workshop on magmatic processes of early planetary crusts: Magma oceans and stratiform layered intrusions.* (eds. Walker and McCallum) *LPI Tech. Rpt.* 82-01, 106-108. Lunar Planetary Institute, Houston.  
EETA79001

McSween H.Y. (1983) The role of assimilation in shergottite petrogenesis (abs). *Meteoritics* 18, 354-355.  
EETA79001

McSween H.Y. (1984) SNC meteorites: Are they Martian rocks? *Geology* 12, 3-6. (*review paper*)  
ALHA77005 EETA79001

McSween H.Y. (1985a) SNC meteorites: Clues to Martian petrologic evolution? *Rev. Geophys.* 23, 391-416. (*review paper*)

McSween H.Y. (1985b) What we know about Mars (but otherwise wouldn't) if it is the shergottite parent body (abs). *Lunar Planet. Sci. XVI*, 546-547. Lunar Planetary Institute, Houston (CD-ROM)

McSween H.Y. (1986) Complex igneous processes in the shergottite parent body (abs). *Lunar Planet. Sci. XVII*, 541-542. Lunar Planetary Institute, Houston  
EETA79001

McSween H.Y. (1987) Meteorites and their Parent Bodies. Cambridge University Press, NY. 237 pp.

McSween H.Y. (1994) What we have learned about Mars from SNC meteorites. *Meteoritics* 29, 757-779. (*review paper*)

McSween H.Y. (1995) Mars, on the rocks with a bit of seltzer. *Meteoritics* 29, 241-242. (*editorial*)  
ALH84001

McSween H.Y. (1996) Evidence for ancient life in a Martian meteorite (!or?) *Meteoritics & Planet. Sci.* 31, 691-692.  
ALH84001

McSween H.Y. (1997) Evidence for life in a Martian meteorite? *GSA Today* 7-7, 1-7.  
ALH84001

McSween H.Y. (1998) Key research: Martian meteorites and their relationships to planetary geology and perhaps biology (abs). *Workshop on the Issue Martian Meteorites: Where - - - #7005.* Lunar Planetary Institute, Houston.

McSween H.Y. (2001) The rocks from Mars, from far and near. *Meteoritics & Planet. Sci.* 36, A129-130.

McSween H.Y. (2002) The rocks of Mars, from far and near. *Meteoritics & Planet. Sci.* 37, 7-25.

- McSween H.Y. and Stolper E.M. (1978) Petrologic evolution of the shergottite parent body crust (abs). *Meteoritics* 13, 560.  
Shergotty Zagami
- McSween H.Y., Taylor L.A. and Stolper E.M. (1979a) Allan Hills 77005: A new meteorite type found in Antarctica. *Science* 204, 1201-1203.  
ALHA77005
- McSween H.Y., Stolper E.M., Taylor L.A., Muntean R.A., O'Kelley G. D., Eldridge J.S., Biswas S., Ngo H.T. and Lipschutz M.E. (1979b) Petrogenetic relationship between Allan Hills 77005 and other achondrites. *Earth Planet. Sci. Lett.* 45, 275-284.  
ALHA77005
- McSween H.Y. and Stolper E. M. (1980) Basaltic meteorites. *Scientific American* 242 (6), 54-63. (review paper)
- McSween H.Y. and Stöffler D. (1980) Shock metamorphic features in ALHA77005 meteorite (abs). *Lunar Planet. Sci.* XI, 717-719. Lunar Planetary Institute, Houston.  
ALHA77005
- McSween H.Y. and Reid A.M. (1981) Igneous layering in an achondrite meteorite (abs). *Meteoritics* 16, 359.  
EETA79001
- McSween H.Y. and Grimm R.E. (1982) Shergottite parent body controversy: The gravity of the situation (abs). *Meteoritics* 17, 252-253.  
Shergotty Zagami
- McSween H.Y. and Jarosewich E. (1982) Petrogenesis of the EETA79001 achondrite (abs). *Lunar Planet. Sci.* XIII, 503-504. Lunar Planetary Institute, Houston.  
EETA79001
- McSween H.Y. and Jarosewich E. (1983) Petrogenesis of the EETA79001 meteorite: Multiple magma pulses on the shergottite parent body. *Geochim. Cosmochim. Acta* 47, 1501-1513.  
EETA79001
- McSween H.Y., Lundberg L.L. and Crozaz G. (1988) Crystallization of the ALHA77005 shergottite: How closed is a closed system? (abs). *Lunar Planet. Sci.* XIX, 766-767. Lunar Planetary Institute, Houston.  
ALHA77005
- McSween H.Y., Lundberg L.L. and Crozaz G. (1990) Petrogenesis of the ALHA77005 shergottite revisited (abs). *Meteoritics* 25, 384.  
ALHA77005
- McSween H.Y. and Harvey R.P. (1993a) Outgassed water on Mars: Constraints from melt inclusions in SNC meteorites. *Science* 259, 1890-1892.
- McSween H.Y. and Harvey R.P. (1993b) Wet inside and out? Constraints on water in the Martian mantle and on outgassed water, based on melt inclusions in SNC meteorites. In *Workshop on early Mars: How warm and how wet?* (eds. Squyres and Kasting) *LPI Tech. Rpt.* 93-03, 18-19. Lunar Planetary Institute, Houston
- McSween H.Y. and Eisenhour D.D. (1996) QUE94201, A noncumulate shergottite (abs). *Lunar Planet.*

*Sci.* XXVII, 853-854. Lunar Planetary Institute, Houston.  
QUE94201

McSween H.Y., Eisenhour D.D., Taylor L.A., Wadhwa M. and Crozaz G. (1996) QUE94201 shergottite:  
Crystallization of a Martian basaltic magma. *Geochim. Cosmochim. Acta* 60, 4563-4569.  
QUE94201

McSween H.Y. and Harvey R.P. (1998a) Brine evaporation: An alternative model for the formation of  
carboanetes in ALH84001 (abs). *Meteoritics & Planet. Sci.* 33, A103.  
ALH84001

McSween H.Y. and Harvey R.P. (1998b) An evaporation model for the formation of carbonates in the  
ALH84001 Martian meteorite. *International Geological Reviews* 40, 774-783.

McSween H.Y. and Treiman A.H. (1998) Martian Meteorites. Chapter 6 in *Planetary Materials*. (Papike J.  
J. ed.) *Reviews of Mineralogy* 36. *Mineralogical Society of America*. (review paper)

McSween H.Y., Lentz R.C.F., Grove T.L. and Dann J.C. (2000) Magmatic water in Shergotty, inferred  
from light-lithophile-element patterns and crystallization experiments (abs). *Meteoritics & Planet. Sci.*  
35, A107.  
Shergotty

McSween H.Y. and Keil K. (2000) Mixing relationships in Martian regolith and the composition of  
globally homogeneous dust. *Geochim. Cosmochim. Acta* 64, 2155-2166.

McSween H.Y. Grove T.L., Lentz R.C.F., Dann J.C., Riciputi L.R. and Ryan J.G. (2001a) Water in the  
Shergotty magma and implications for outgassing and magma fractionation on Mars (abs). *Eleventh  
Goldschmidt Conf.* 3012.

McSween H.Y., Grove T.L., Lentz R.C.F., Dann J.C., Holzheid A.H., Riciputi L.R. and Ryan J.G. (2001b)  
Geochemical evidence for magmatic water within Mars from pyroxenes in the Shergotty meteorite.  
*Nature* 409, 487-490.  
Shergotty

McSween H.Y., Grove T.L. and Wyatt M.B. (2003a) Basalt versus andesite in the Martian crust: New  
geochemical perspectives (abs#1189). *Lunar Planet. Sci. Conf.* XXXIV Lunar Planetary Institute,  
Houston (CD-ROM).

McSween H.Y., Grove T.L. and Wyatt M.B. (2003b) Pertochemical comparison of the ancient and recent  
(SNC) Martian crust (abs). *Meteoritics & Planet. Sci.* 38, A13.

McSween H.Y. and 34 authors (2004) Basaltic rocks analyzed by the Spirit Rover in Gusev Crater.  
*Science* 305, 842-845.

McSween H.Y. et al. (2005) Comparison of olivine-rich Martian basalts and olivine-phyric shergottites  
(abs#1202). *Lunar Planet. Sci. XXXVI* Lunar Planetary Institute, Houston. (CD-ROM)

McSween H.Y. and 41 authors (2006) Characterization and petrologic interpretation of olivine-rich basalts  
at Gusev Crater, Mars. *J. Geophys. Res.* 111, E02S10

McSween H.Y. and 13 authors (2006) Alkaline rocks from the Columbia Hills, Gusev Crater. *J. Geophys.  
Res.* 111, doi:10.1029/2006JE002698.

McSween H.Y., Lang N.P. and Tornabene L.L. (2007) Are SNC meteorites from Tharsus? (abs#5067).  
*Meteoritics & Planet. Sci.* 42, A104.

- McSween H.Y. and Taylor G.J. (2009) Diagnostic geochemical and mineralogical fingerprints for Mars; A critical reassessment (abs#1269). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.
- Mellin M.J., Lin Y., Schnare D.W. and Taylor L.A. (2008) Revised compositional estimate of EETA79001 lithology A groundmass (abs#2150). *Lunar Planet. Sci.* XXXVI Lunar Planetary Institute, Houston. (CD-ROM)  
EETA79001
- Melosh H.J. (1984) Impact ejection, spallation, and the origin of meteorites. *Icarus* 59, 234-260.
- Melosh H.J. (1985) Ejection of rock fragments from planetary bodies. *Geology* 13, 144-148.
- Melosh H.J. (1988) The rocky road to panspermia. *Nature* 332, 687-688.
- Melosh H.J. (1997) Mars meteorites and panspermian possibilities. (abs) In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life.* (eds. Clifford et al.) *LPI Tech. Rpt.* 97-0, Lunar Planetary Institute, Houston
- Melosh H.J., Treiman A.H. and Greive R.A.F. (1983) Olivine composition glass in the Chassigny meteorite: Implications for shock history (abs). *EOS, Trans.* 64, 254. AGU  
Chassigny
- Melosh H.J. and Vickery A.M. (1989) Impact erosion of the primordial atmosphere of Mars. *Nature* 338, 487-489.
- Melosh H.J. and Tonks W.B. (1993) Swapping rocks: Ejection and exchange of surface materials among the terrestrial planets (abs). *Meteoritics* 28, 393.
- Mermelengas N., DeLaeter J.R. and Rosman K.J.R. (1979) New data on the abundance of palladium in meteorites. *Geochim. Cosmochim. Acta* 43, 747-754.  
Nakhla
- Meunier S. (1911) Examen chimique et lithologique de la meteorite d'El Nakhla. *Séance, 3 Compt. Rend. Acad. Sci. Paris* vol cliii, 524, 785-787.  
Nakhla
- Miao B., Ouyang Z., Wang D., Ju Y., Wang G. and Lin Y. (2004) A new Martian meteorite from Antarctica: Grove Mountains (GRV) 020090. *Acta Geologica Sinica* 78, 1034-1041.  
GRV020090
- Michel J. (1912) Die feldspate der meteoriten. *Tschermak's Miner. Petrogr. Mitt.* 31, 563-658.  
Shergotty
- Mikouchi T. (1999) Preliminary examination of Dar al Gani 476: A new basaltic Martian meteorite simimilar to lithology A of EETA79001 (abs#1557). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM)  
DaG476 EETA79001
- Mikouchi T. (2000) Pyroxene and plagioclase in the Los Angeles Martian meteorite: Comparison with the Queen Alexandra Range 94201 Martian meteorite and the Asuka 881757 lunar meteorite (abs). *Meteoritics & Planet. Sci.* 35, A110.  
Los Angeles QUE94201
- Mikouchi T. (2001) Mineralogical similarities and differences between the Los Angeles basaltic

shergottites and the Asuka-881757 lunar mare meteorite. *Antarct. Meteorite Res.*, 14, 1-20. Nat. Inst. Polar Res., Tokyo.  
Los Angeles

Mikouchi T. (2002) Maskelynite (abs). *Meteoritics & Planet. Sci.* 37, A100.

Mikouchi T. (2005a) Comparative mineralogy of Chassigny and NWA2737: Implications for the formation of Chassignite igneous body(s) (abs#5240). *Meteoritics & Planet. Sci.* 40, A102. Chassigny NWA2737

Mikouchi T. (2005b) Northwest Africa 1950: Mineralogy and comparison with Antarctic Iherzolitic shergottites. *Geochim. Cosmochim. Acta* 40, 1621-1634. NWA1950

Mikouchi T. (2008) Petrographic and chemical variation of Iherzolitic shergottites and implications for the classification of shergottites (abs) *Meteor. & Planet. Sci.* 43, A186. RBT04262 NWA4468

Mikouchi T. (2009) Petrological and mineralogical diversities within the Iherzolitic Shergottites require a new group name (abs#2272). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.

Mikouchi T. and Miyamoto M. (1996a) A new member of Iherzolite shergottite from Japanese Antarctic meteorite collection: Mineralogy and petrology of Yamato- Y793605 (abs). *Proc. NIPR Sym. Antarctic Meteorites* 21st, 104-106. Nat. Inst. Polar Res., Tokyo. Y793605

Mikouchi T. and Miyamoto M. (1996b) Comparative mineralogy of Antarctic Iherzolitic shergottites Allan Hills 77005, Lewis Cliff 88516 and Yamato 793605 (abs). *Meteoritics & Planet. Sci.* 31, A89-A90. ALHA77005 LEW88516 Y793605

Mikouchi T. and Miyamoto M. (1997a) Major and minor element distributions in pyroxene and maskelynite from Martian meteorite Yamato-793605 and other Iherzolites: Clues to their crystallization histories. (abs). *NIPR Sym. Antarctic Meteorites* 22nd, 109-111. Nat. Inst. Polar Res., Tokyo. Y793603

Mikouchi T. and Miyamoto M. (1997b) Yamato- Y793605: A Iherzolite shergottite from Japanese Antarctic meteorite collection. *Antarctic Meteorite Res.* 10, 41-60. Nat. Inst. Polar Res., Tokyo. Y793605

Mikouchi T. and Miyamoto M. (1998) Pyroxene and olivine microstructures in Nakhlite Martian meteorites: Implication for their thermal history (abs#1574). *Lunar Planet. Sci. XXIX* Lunar Planetary Institute, Houston (CD-ROM). Nakhla Governador Valadares Lafayette

Mikouchi T., Miyamoto M. and McKay G.A. (1996) Mineralogy and petrology of new Antarctic shergottite QUE94201: A coarse-grained basalt with unusual pyroxene zoning (abs). *Lunar Planet. Sci. XXVII*, 879-880. Lunar Planetary Institute, Houston QUE94201

Mikouchi T., Miyamoto M. and McKay G. A. (1997a) Similarities in zoning of pyroxenes from QUE94201 and EETA79001 Martian meteorites. (abs) *Lunar Planet. Sci. XXVIII*, 955-956. Lunar Planetary Institute, Houston QUE94201 EETA79001 ALHA77005 LEW88516 Y793605 Shergotty Zagami

Mikouchi T., Miyamoto M. and McKay G. A. (1997b) Crystallization histories of basaltic shergottites as inferred from chemical zoning of pyroxene and maskelynite. (abs) *Meteoritics & Planet. Sci.* 32, A92-93.

Shergotty Zagami EETA79001 QUE94201

Mikouchi T., Miyamoto M. and McKay G.A. (1998a) Mineralogy of Antarctic basaltic shergottite Queen Alexandra Range 94201: Similarities to Elephant Moraine A79001 (Lithology B) Martian meteorite. *Meteoritics & Planet. Sci.* 33, 181-189.

QUE94201 EETA79001

Mikouchi T., Miyamoto M. and McKay G.A. (1998b) Mineralogical characterization of heated "maskelynitized" plagioclase glass in Zagami Martian meteorite (abs). *Meteoritics & Planet. Sci.* 33, A109.

Zagami

Mikouchi T., Miyamoto M. and McKay G.A. (1998c) Shocked plagioclase in Martian and lunar meteorites: Textures, chemical compositions, Raman spectra, and implications for their post-shock thermal histories (abs). *NIPR Sym. Antarctic Meteorites* 23rd, 77-79. Nat. Inst. Polar Res., Tokyo. Zagami

Mikouchi T., Osaka T., Kaneda K. and Ohsumi K. (1998d) X-ray diffraction study of shocked plagioclase in Martian and Lunar meteorites with the micro-area Laue method using synchrotron radiation (abs). *NIPR Sym. Antarctic Meteorites* 23rd, 80-82. Nat. Inst. Polar Res., Tokyo.  
ALH77005 Zagami QUE94201 Y793605 ALH84001

Mikouchi T., Miyamoto M. and McKay G.A. (1998e) What were the major factors that controlled mineralogical similarities and differences of basaltic Iherzolitic and clinopyroxenic Martian meteorites within each group? (abs) *Workshop on the Issue Martian Meteorites: Where - - - #7016*. Lunar Planetary Institute, Houston.

Mikouchi T., Miyamoto M. and McKay G.A. (1999a) Cooling rates of olivine in the Martian meteorites Dar al Gani 476 and Elephant Moraine 79001 (abs). *Meteoritics & Planet. Sci.* 34, A81-82.  
DaG476 EET79001

Mikouchi T. and Miyamoto M. (1999b) Micro Raman spectroscopy of amphiboles and Al-Ti-rich pyroxenes in the Martian meteorites Zagami and LEW88516 (abs#1559). *Lunar Planet. Sci. XXX* Lunar Planetary Institute, Houston (CD-ROM)  
Zagami LEW88516

Mikouchi T., Miyamoto M. and McKay G.A. (1999c) Olivine megacrysts in the basaltic Martian meteorites Dar al Gani 476 and EETA79001: Cooling rates deduced from Fe-Mg zoning of olivine (abs). *NIPR Sym. Antarctic Meteorites* 24th, 102-104. Nat. Inst. Polar Res., Tokyo.  
DaG476 EETA79001

Mikouchi T., Miyamoto M. and McKay G.A. (1999d) The role of undercooling in producing igneous zoning trends in proxenes and maskelynites among basaltic Martian meteorites. *Earth Planet. Sci. Lett.* 173, 235-256.

Shergotty Zagami EET79001 QUE94201

Mikouchi T., Yamada I. and Miyamoto M. (2000) Symplectic exsolution in olivine from the Nakhla Martian meteorite. *Meteoritics & Planet. Sci.* 35, 937-942.  
Nakhla

Mikouchi T. and Miyamoto M. (2000a) Lherzolitic Martian meteorites Allan Hills 77005, Lewis Cliff 88516 and Yamato-793605: Major and minor element zoning in pyroxene and plagioclase glass.

*Antarct. Meteorite Res.* 13, 256-269.  
ALH77005 LEW88516 Y793605

Mikouchi T. and Miyamoto M. (2000b) Micro Raman spectroscopy of amphiboles and pyroxenes in the Martian meteorites Zagami and Lewis Cliff 88516. *Meteoritics & Planet. Sci.* 35, 155-159.  
Zagami LEW88516

Mikouchi T., Ikiko Y. and Miyamoto M. (2000) Symplectitic exsolution in olivine from the Nakhla Martian meteorite. *Meteoritics & Planet. Sci.* 35, 937-942.  
Nakhla

Mikouchi T., Koizumi E., McKay G., Le L. and Schwandt C. (2001a) Experimental crystallization of the QUE94201 basaltic shergottite (abs#2100). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
QUE94201

Mikouchi T., Miyamoto M. and McKay G. A. (2001b) Mineralogy and petrology of the Dar al Gani 476 Martian meteorite: Implications for its cooling history and relationship to other shergottites.  
*Meteoritics & Planet. Sci.* 36, 531-548.  
DaG476

Mikouchi T. and Miyamoto M. (2001a) Dhofar 019 shergottite: Mineralogy and petrology of a new member of the basaltic Martian meteorites (abs#1644). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
Dho019

Mikouchi M.E. and Miyamoto M. (2001b) Northwest Africa 817: A new nakhelite similar to others but distinct (abs). *Meteoritics & Planet. Sci.* 36, A134.  
NWA817

Mikouchi M.E. and Miyamoto M. (2002a) Comparative cooling rates of nakhlites as inferred from iron-magnesium and calcium zoning of olivines (abs#1343). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)  
NWA817

Mikouchi M.E. and Miyamoto M. (2002b) Olivine cooling rate of the Northwest Africa 1068 shergottite (abs#1562). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)  
NWA1068

Mikouchi M.E. and Miyamoto M. (2002c) Mineralogy and olivine cooling rate of the Dhofar 019 shergottite. *Antarct. Meteorite Res.* 15, 122-142.  
Dho019

Mikouchi T., Koizumi E., Monkawa A., Ueda Y. and Miyamoto M. (2002d) Comparative mineralogy of the new nakhelite Yamato-000593 with other nakhelite Martian meteorites (abs). *Antarctic Meteorites* XXVII, 83-85, Nat. Inst. Polar Res., Tokyo.  
Y000593

Mikouchi T. and McKay G. (2003) Shock heating and subsequent cooling of basaltic shergottites: The case for QUE94201 and Dhofar 378 (abs#1920). *Lunar Planet. Sci.* XXXIV. Lunar Planetary Institute, Houston  
QUE94201 Dho378

Mikouchi T., Koizumi E., Monkawa A., Ueda Y. and Miyamoto M. (2003a) Mineralogical comparison of Y000593 with other nakhlites: Implications for relative burial depths of nakhlites (abs#1883). *Lunar*

*Planet. Sci.* XXXIV. Lunar Planetary Institute, Houston  
Y000593

Mikouchi T., Koizumi E., Monkawa A., Ueda Y. and Miyamoto M. (2003b) Mineralogy and petrology of Yamato 000593: Comparison with other Martian nakhelite meteorites. *Antarct. Meteorite Res.* 16, 34-57. Nat. Inst. Polar Res., Tokyo.  
Y000593

Mikouchi T., Koizumi E., McKay G., Monkawa A., Ueda Y. and Miyamoto M. (2003c) Mineralogy and petrology of the Yamato 980459 Martian meteorite: A new shergottite-related rock (abs). International Symposium. *Evolution of Solar System: A New Perspective from Antarctic Meteorites*, 82-83. Nat. Inst. Polar Res., Tokyo.  
Y980459

Mikouchi T., Koizumi E., McKay G., Monkawa A., Ueda Y., Chokai J. and Miyamoto M. (2004) Yamato 980459: Mineralogy and petrology of a new shergottite-related rock from Antarctica. *Antarct. Meteorite Res.* 17, 13-34. Nat. Inst. Polar Res., Tokyo.  
Y980459

Mikouchi T., Monkawa A., Koizumi E., Chokai J. and Miyamoto M. (2005) MIL03346 Nakhelite and NWA2737 (Diderot) Chassignite: Two new Martian cumulate rocks from hot and cold deserts (abs#1944). *Lunar Planet. Sci. XXXVI* Lunar Planetary Institute, Houston. (CD-ROM)  
MIL03346 NWA2737

Mikouchi T., Miyamoto M., Koizumi E., Makishima J. and McKay G. (2006) Relative burial depths of nakhlites: an update (abs#1865). *Lunar Planet. Sci. Conf. XXXVII* Lunar Planetary Institute, Houston. (CD-ROM)

Mikouchi T. and McKay G. (2006) Shock metamorphism of he Dhofar 378 basaltic Shergotite (abs). *Antarctic Meteorites XXX*, 59-60. Nat. Inst. Polar Res., Tokyo.  
Dho378

Mikouchi T. and Kurihara T. (2007) Y000027, Y000047 and Y000097: Mineralogy and petrology of paired Yamato 00 lherzolitic shergottites. *Antarctic Meteorites XXXI*, 52-53. Nat. Inst. Polar Res., Tokyo.  
Y000097

Mikouchi T. and Koizumi E. (2007) Theoretical crystallization of a reduced shergottite: Applying MELTS to Y-980459 (abs). *Meteoritics & Planet. Sci.* 42, A107.  
Y980459

Mikouchi T. and Kurihara T. (2007) Y-000027, Y000047, Y000097: More fragments of the lherzolitic shergottite block (abs#5290). *Meteoritics & Planet. Sci.* 42, A107.  
Y000097

Mikouchi T., Kurihara T. and Miyamoto M. (2008) Petrology and mineralogy of RBT04262: Implications for stratigraphy of the lherzolitic shergottite igneous block (abs#2403). *Lunar Planet. Sci. XXXIX*. Lunar Planetary Inst. Houston.  
RBT04262

Min K. and Reimers P.W. (2005) Low-temperature thermal history of Martian meteorite ALH84001 from (U-Th)/He thermochemistry (abs#1499). *Lunar Planet. Sci. XXXVI* Lunar Planetary Institute, Houston. (CD-ROM)  
ALH84001

- Minniti M.E., Rutherford M.J., Giletta B.J. and Schultz P.H. (1997) The effects of impact on D/H of hornblends: Applications to SNC petrogenesis (abs). *Lunar Planet. Sci.* XXVIII, 959-960. Lunar Planetary Institute, Houston
- Minniti M.E. and Rutherford M.J. (1998) Assesment of shock effects on hornblende water contents and isotopic compositions (abs). *Lunar Planet. Sci.* XXIX (CD-ROM) Lunar Planetary Institute, Houston.
- Minniti M.E. and Rutherford M.J. (2000) Genesis of the Mars Pathfinder “sulfur-free” rock from SNC parental liquids. *Geochim. Cosmochim. Acta* 64, 2535-2547.
- Minniti M.E. and Mysen B.O. (2001) Investigation of kaersutite crystallization in SNC basaltic magmas (abs). Eleventh Goldschmidt Conf. 3419.
- Minniti M.E., Leshin L.A., Guam Y., Luo S. and Ahrens T.J. (2003) The effect of impact shock on water and H isotopes in amphibole (abs#1524). *Lunar Planet. Sci.* XXXIV Lunar Planetary Institute, Houston.
- Misawa K. (2003) The Yamato 980459 shergottite consortium. (abs) International Symposium. *Evolution of Solar System: A New Perspective from Antarctic Meteorites*, 84-85. Nat. Inst. Polar Res., Tokyo. Y980459
- Misawa K. (2004) The Yamato 980459 olivine-phyric shergottite consortium. *Antarct. Meteorite Res.* 17, 1-12. Nat. Inst. Polar Res., Tokyo. <http://yamato.nipr.ac.jp/AMRC/amr17/AMR1701.pdf>  
Y980459
- Misawa K., Nakamura N., Premo W.R. and Tatsumoto M. (1997a) U-Th-Pb isotopic systematics of lherzolitic shergottite Yamato 793605 (abs). *NIPR Sym. Antarctic Meteorites* 22nd, 115-117. Nat. Inst. Polar Res., Tokyo.  
Y793605
- Misawa K., Nakamura N., Premo W.R. and Tatsumoto M. (1997b) U-Th-Pb isotopic systematics of lherzolitic shergottite Yamato 793605. *Antarct. Meteorite Res.* 10, 95-108. Nat. Inst. Polar Res., Tokyo.  
Y793605
- Misawa K., Yamazaki F., Sawada S., Sekine T. and Nakamura N. (2000) Incorporation of radiogenic lead into plagioclase during shock metamorphism (abs). *Meteoritics & Planet. Sci.* 35, A111.  
Y793605
- Misawa K., Shih C.-Y., Wiesmann H. and Nyquist L.E. (2003a) Crystallization and alteration ages of the Antarctic nakhelite Yamato 000593 (abs#1556). *Lunar Planet. Sci.* XXXIV Lunar Planetary Institute, Houston.  
Y000593
- Misawa K., Kojima H., Imae N. and Nakamura N. (2003b) The Yamato nakhelite consortium. *Antarct. Meteorite Res.* 16, 1-12. Nat. Inst. Polar Res., Tokyo.  
Y000593 Y0000749 Y0000802
- Misawa K., Shih C.-Y., Wiesmann H., Garrisopn D.H. Nyquist L.E. and Bogard D.D. (2005a) Rb-Sr, Sm-Nd and Ar-Ar isotopic systematics of Antarctic nakhelite Yamato 000593. *Antarct. Meteorite Res.* 18, 133-151. Nat. Inst. Polar Res., Tokyo.  
Y000593
- Misawa K., Shih C-Y., Reese Y. and Nyquist L.E. (2005b) Crystallization age and source signature of Chassigny (abs#1499). *Lunar Planet. Sci.* XXXVI Lunar Planetary Institute, Houston. (CD-ROM)

Chassigny

Misawa K., Shih C-Y., Reese Y., Nyquist L.E. and Barrat J-A. (2005c) Rb-Sr and Sm-Nd isotopic systematics of NWA 2737 chassignite (abs). *Meteoritics & Planet. Sci.* 40, A104.  
NWA2737

Misawa K., Yamada K., Nakamura N., Morikawa N., Kondorosi G., Yamashita K. and Premo W.R. (2006a) Sm-Nd isotopic systematics of lherzolitic shergottite Yamato-793605 (abs#1892.) *Lunar Planet. Sci. Conf. XXXVII* Lunar Planetary Institute, Houston  
Y793605

Misawa K., Iwata N., Imae N., Franchi I.A., Greenwood R.C. and Kojima H. (2006b) New Lherzolite shergottites from the Yamato Mountains (abs). *Antarctic Meteorites XXX*, 59-60. Nat. Inst. Polar Res., Tokyo.  
Y000027 Y000047 Y000097

Misawa Keiji, Yamada K., Nakamura N., Morikawa N., Yamashita K. and Premo W. (2006c) Sm-Nd isotopic systematics of the lherzolitic shergottite Yamato-793605. *Antarctic Meteorite Research* 19, 45-57. Nat. Inst. Polar Res., Tokyo.  
Y793605

Misawa K., Shih C-Y., Reese Y. and Nyquist L.E. (2007) Rb-Sr and Sm-Nd isotopic studies of lherzolitic shergottite Yamato 000097 (abs). *Antarctic Meteorites XXXI*, 54-55. Nat. Inst. Polar Res., Tokyo.  
Y000097

Misawa K. and Yamaguchi A. (2007) U-Pb ages of NWA 856 baddeleyite (abs). *Meteoritics & Planet. Sci.* 42, A108.  
NWA856

Mittlefehldt D.W. (1993) Igneous fractionation and subsolidus equilibration of diogenite meteorites (abs). *Lunar Planet. Sci. XXIV*, 993-994. Lunar Planetary Institute, Houston.

Mittlefehldt D.W. (1994a) ALH84001, A cumulate orthopyroxenite member of the Martian meteorite clan. *Meteoritics* 29, 214-221.  
ALH84001

Mittlefehldt D.W. (1994b) ALH84001 cumulate orthopyroxenite: A previously unappreciated Martian meteorite (abs). *Lunar Planet. Sci. XXV*, 911-912. Lunar Planetary Institute, Houston  
ALH84001

Mittlefehldt D.W. (1994c) ALH84001, A cumulate orthopyroxenite member of the Martian meteorite clan. (*a correction*) *Meteoritics* 29, 900.  
ALH84001

Mittlefehldt D.W. (1996) Survey of carbonates in ALH84001. Curator's report. JSC Curator's Office, Houston.  
ALH84001

Mittlefehldt D.W. (1997a) The source of ALH84001. *The Planetary Report* XVII, 8-11.  
ALH84001

Mittlefehldt D.W. (1997b) Macroscopic description of Allan Hills 84001 and the relative timing of events in its history (abs). *Meteoritics & Planet. Sci.* 32, A93.  
ALH84001

- Mittlefehldt D.W. (2000) The latest news from Mars. *Science* 287, 1601-1602.
- Mittlefehldt D.W. (2002) Geochemistry of Martian meteorites and the petrological evolution of Mars (abs). Un-mixing SNCs. 37-38. LPI Contribution No. 1134. Lunar Planetary Institute, Houston
- Mittlefehldt D.W. and Lindstrom M.M. (1988) HED petrogenesis. View from the diogenite end (abs). *Meteoritics* 23, 290.  
ALH84001
- Mittlefehldt D.W. and Lindstrom M.M. (1989a) Diogenite petrogenesis: Geochemistry and petrology of whole rocks and coarse-grained separates (abs). *Lunar Planet. Sci. XX*, 697-698. Lunar Planetary Institute, Houston.  
ALH84001
- Mittlefehldt D.W. and Lindstrom M.M. (1989b) Weathering in Antarctic meteorites: an INAA-SEM study (abs). *Meteoritics* 24, 304-305.
- Mittlefehldt D.W. and Lindstrom M.M. (1991) Generation of abnormal trace element abundances in Antarctic eucrites by weathering processes. *Geochim. Cosmochim. Acta* 55, 77-87.
- Mittlefehldt D.W. and Lindstrom M.M. (1994a) Geochemical evidence for mixing of three components in Martian orthopyroxenite ALH84001 (abs). *Meteoritics* 29, 504.  
ALH84001
- Mittlefehldt D.W. and Lindstrom M.M. (1994b) ALH84001 orthopyroxenite: Comparison with other Martian meteorites and Yamato 75032-type and LEW88xxx ferroan diogenites (abs). *NIPR Sym. Antarctic Meteorites*, 19th, 179-182. Nat. Inst. Polar Res., Tokyo.  
ALH84001
- Mittlefehldt D.W., Lindstrom M.M. and Gibson E.K. (1995) ALH84001: Trace element geochemical similarities of its trapped melt component to Nakhla, Lafayette and Chassigny (abs). *Lunar Planet. Sci. XXVI*, 983-984. Lunar Planetary Institute, Houston  
Nakhla Lafayette Chassigny ALH84001
- Mittlefehldt D.W. and Lindstrom M.M. (1996) Martian meteorites QUE94201, an unusual basalt, and Governador Valadares, a typical clinopyroxenite: Geochemistry (abs). *Lunar Planet. Sci. XXVII*, 887-888. Lunar Planetary Institute, Houston  
QUE94201 Governador Valadares
- Mittlefehldt D.W., Lindstrom D.J. and Lindstrom M.M. (1996) Martian alteration effects on bulk compositions of Martian meteorites (abs). *Meteoritics & Planet. Sci.* 31, A90-A91.  
Lafayette
- Mittlefehldt D.W. and Lindstrom M.M. (1997) Early Mars evolution: Clues from Martian meteorties (abs). *7th Goldschmidt Conf., LPI Contribution* 921, 142. Tucson.
- Mittlefehldt D.W., Lindstrom D.J., Lindstrom M.M. and Martinez R.R. (1997a) Lithology A in EETA79001-Product of impact melting on Mars (abs). *Lunar Planet. Sci. XXVIII*, 961-962. Lunar Planetary Institute, Houston  
EETA79001
- Mittlefehldt D.W., Wentworth S.J., Wang M.-S., Lindstrom M.M. and Lipschutz M.E. (1997b) Geochemistry of and alteration phases in Martian lherzolite Y-793605. *Antarctic Meteorite Res.* 10, 109-124. Nat. Inst. Polar Res., Tokyo.  
Y793605 LEW88516 ALHA77005

Mittlefehldt D.W. and Lindstrom M.M. (1999) Petrology and geochemistry of Martian meteorites EETA79001 and ALHA77005 (abs#1817). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM)  
EETA79001 ALHA77005

Mittlefehldt D.W., Lindstrom D.J., Lindstrom M.M. and Martinez R.R. (1999) An impact-melt origin for lithology A of martian meteorite Elephant Moraine A79001. *Meteoritics & Planet. Sci.* 34, 357-367.  
EET79001

Mittlefehldt D.W. and Herrin J.S. (2008) Petrology and geochemistry of Martian meteorites LAR 06319, RBT 04261 and RBT 04262 (abs). *Meteor. & Planet. Sci.* 43, A100.  
LAR06319 RBT04262

Miura Y.N. (1995) *Studies on differentiated meteorites: Evidence from  $^{244}\text{Pu}$ -derived fission Xe,  $^{81}\text{Kr}$ , other noble gases and nitrogen.* PhD Dissertation, Univ. Tokyo, Tokyo.  
ALH84001

Miura Y.N., Okamoto M. and Iancu O.G. (1993) Ejection process of Martian meteorites from shock metamorphism (abs). *Meteoritics* 28, 402.

Miura Y.N., Sugiura N. and Nagao K. (1994) New SNC meteorite ALH84001: Evidence for SNC meteorite from noble gases (abs). *Lunar Planet. Sci.* XXV, 919-920. Lunar Planetary Institute, Houston  
ALH84001

Miura Y.N. and Sugiura N. (1994) Heavy nitrogen in a SNC orthopyroxenite ALH84001 (abs). *NIPR Sym. Antarctic Meteorites* 19th, 151-153. Nat. Inst. Polar Res., Tokyo.  
ALH84001

Miura Y.N., Nagao K., Sugiura N., Sagawa H. and Matsubara K. (1995) Orthopyroxenite ALH84001 and shergottite ALHA77005: Additional evidence for a Martian origin from noble gases. *Geochim. Cosmochim. Acta* 59, 2105-2113.  
ALH84001 ALHA77005

Miura Y.N. and Sugiura N. (2000) Martian atmosphere-like nitrogen in the orthopyroxenite ALH84001. *Geochim. Cosmochim. Acta* 64, 559-572.  
ALH84001

Miyamoto M., Koizumi E. and Mikouchi T. (2009) Cooling rates of Y980459 and DaG496 (2009) (abs#1143). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.

Moggi-Cecchi V., Pratesi G., Fanchi I.A. and Greenwood R.C. (2009) Textural and compositional features of NWA 4222, a new Martian meteorite (abs#1387). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.  
NWA4222

Mohapatra R.K., Mahajan R.R. and Murty S.V.S. (1998) Nitrogen and argon in Shergotty (abs). *Meteoritics & Planet. Sci.* 33, A112.  
Shergotty

Mohapatra R.K. and Ott U. (2000) Trapped noble gases in Sayh al Uhaymir 005: A new Martian meteorite from Oman (abs). *Meteoritics & Planet. Sci.* 35, A113.  
SaU005

Mohapatra R.K. and Murty S.V.S. (2001) Precursors of Mars – Clues from nitrogen and oxygen isotopes. *Meteoritics & Planet. Sci.* 36, A138-139.

Mohapatra R.K., Schwenzer S. P., Herrmann S. and Ott U. (2001) Trapped nitrogen and Noble gases in a shock-glass from Sayh al Uhaymir 005 – The Martian meteorite from Oman (abs). *Meteoritics & Planet. Sci.* 36, A139.  
SaU005

Mohapatra R.K., Schwenzer S.P. and Ott U. (2002a) Krypton and xenon in Martian meteorites from hot deserts – the low temperature component (abs#1532). *Lunar Planet. Sci. XXXIII* Lunar Planetary Institute, Houston. (CD-ROM)  
SaU005

Mohapatra R.K., Schwenzer S.P., Herrmann S. and Ott U. (2002b) Nitrogen and noble gases in the basaltic shergottite QUE94201 (abs). *Meteoritics & Planet. Sci.* 37, A102.  
QUE94201

Mohapatra R.K. and Murty S.V.S. (2002) Silicon in Mars' core: A prediction based on Mars model using nitrogen and oxygen isotopes in SNC meteorites (abs). Un-mixing SNCs. 39-40. LPI Contribution No. 1134. Lunar Planetary Institute, Houston

Mohapatra R.K and Murty S.V.S. (2003) Precursors of Mars: Constraints from nitrogen and oxygen isotopic compositions of Martian meteorites. *Meteoritics & Planet. Sci.* 38, 225-241.

Mohapatra R.K. and Gilmour J.D. (2003) Understanding the I-Xe systematics of the Martian mantle (abs). *Meteoritics & Planet. Sci.* 38, A105.

Mohapatra R.K., Schwenzer S.P. and Ott U. (2003) Trapped Neon in the Martian meteorite SaU 005 (abs). *Meteoritics & Planet. Sci.* 38, A109.  
SaU005

Mohapatra R.K., Crowther S. and Gilmour J.D. (2005) Xenon in Yamato 000593 & NWA817 nakhrites from two diverse terrestrial environments (abs#1499). *Lunar Planet. Sci. XXXVI* Lunar Planetary Institute, Houston. (CD-ROM)  
Y000593 NWA817

Mohapatra R.K., Crowther S.A., Gilmour J.D. and Marty B. (2006) Xenon isotopic components in NWA2737 – A chassignite from the hot desert (abs#1840). *Lunar Planet. Sci. Conf. XXXVII* Lunar Planetary Institute, Houston  
NWA2737

Mojzsis S.J. and Arrhenius G. (1998) Phosphates and carbon on Mars: Exobiological implications and sample return considerations. *J. Geophys. Res.* 103, 28,495-28,511.

Mojzsis S.J., Coath C.D., Bunch T., Blake D., Treiman A.H. and Amundsen H.E.F. (1999) Carbonate “rosettes” in xenoliths from the Spitzbergen: SIMS analysis of O and C isotopic ratios in a potential terrestrial analogue to Martian meteorite ALH 84001 (abs#2032). *Lunar Planet. Sci. XXX* Lunar Planet. Inst. Houston (CD-ROM)

Molini-Velsko C., Mayeda T.K. and Clayton R.N. (1986) Isotopic composition of silicon in meteorites. *Geochim. Cosmochim. Acta* 50, 2719-2726.  
Nakhla Zagami Shergotty

Monkawa A., Makino K., Ishii T., Ohtsuki M., Mikouchi T. and Miyamoto M. (2001) The determination of Fe<sup>2+</sup>/Fe ratios of Kaersutite in the Martian meteorite LEW88516 by electron microprobe (abs).

*Meteoritics & Planet. Sci.* 36, A140.

LEW88516

Monkawa A., Makino K., Mikouchi T., Koizumi E., Ishii T. and Miyamoto M. (2002a) Characteristics of titanium-rich kaersutites in Martian meteorites and terrestrial rocks (abs#1440). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)

Monkawa A., Mikouchi T., Miyamoto M. and Koizumi E. (2002b) Formation of titanium-rich kaersutites in shergottitic Martian meteorites (abs). *Meteoritics & Planet. Sci.* 37, A103.

Monkawa A., Mikouchi T., Miyamoto M., Koisumi E., Miyata Y. and Ohsumi K. (2002c) On the formation of Ti-rich kaersutite amphiboles in Martian meteorites (abs). *Antarctic Meteorites* XXVII, 102-104. Nat. Inst. Polar Res., Tokyo  
LEW88516 Zagami NWA856

Monkawa A., Mikouchi T., Sekine T., Koizumi E. and Miyamoto M. (2003a) Shock formation of kaersutite in Martian meteorites: An experimental study (abs#1534). *Lunar Planet. Sci.* XXXIV Lunar Planetary Institute, Houston.

Monkawa A., Mikouchi T., Koisumi E. and Miyamoto M. (2003b) Electron backscatter diffraction (EBSD) analysis on kaersutite in Martian meteorites (abs). *Meteoritics & Planet. Sci.* 38, A79.

Monkawa A., Mikouchi T., Koizumi E. and Miyamoto M. (2003c) Magmatic inclusion in olivine of the Chassigny martian meteorite: Comparison with other martian meteorite inclusions (abs). International Symposium. *Evolution of Solar System: A New Perspective from Antarctic Meteorites*, 88-89. Nat. Inst. Polar Res., Tokyo.  
Chassigny

Monkawa A., Mikouchi T., Koizumi E. and Miyamoto M. (2005) Comparative mineralogy of magmatic inclusions in olivine from the Chassigny and Nakhla Martian meteorites. *Antarct. Meteorite Res.* 18, 188-201. Nat. Inst. Polar Res., Tokyo.

Chassigny Nakhla

Moore H.J., Hutton R.E., Clow G.D. and Spitzer C.R. (1987) Physical properties of the surface materials at the Viking landing sites on Mars. *U. S. Geol. Sur. Prof. Paper* 1389, 222 pages  
Shadow, Sponge, Metate, Grumpy, Bashful etc.

Morlok A., Anand M. and Grady M.M. (2006) Dust from collisions: Mid-IR absorbance spectroscopy of Martian meteorites (abs#1512). *Lunar Planet. Sci. Conf.* XXXVII Lunar Planetary Institute, Houston

Morgan J.W. and Lovering J.F. (1964) Uranium and thorium abundances in stony meteorites 2. The achondrite meteorites. *J. Geophys. Res.* 69, 1989-1994.

Morgan J.W. and Lovering J.F. (1973) Uranium and thorium in achondrites. *Geochim. Cosmochim. Acta* 37, 1697-1707.  
Nakhla Shergotty

Morgan J.W. and Anders E. (1979) Chemical composition of Mars. *Geochim. Cosmochim. Acta* 43, 1601-1610.

Mori H. and Takeda H. (1983) An electron petrographic study of shock deformation textures of the Antarctic shergottite, Allan Hills 77005. *Proc. 16th ISAS Lunar Planet. Symp.* 105-108. ISAS, Tokyo.  
ALH77005

- Mori H. and Takeda H. (1984) Shock deformation texture of olivine crystals of the EETA79001 shergottite (abs). *Meteoritics* 19, 275.  
EETA79001
- Morikawa N., Kondorosi G., Nakamura N. and Misawa K. (1999) Rb-Sr isotopic systematics and REE-pattern of the Y793605 lherzolitic shergottite (abs). *NIPR Sym. Antarctic Meteorites* 23rd, 91-92. Nat. Inst. Polar Res., Tokyo.  
Y793605
- Morikawa N., Misawa K., Kondorosi G., Premo W.R., Tatsumoto M. and Nakamura N. (2001) Rb-Sr isotopic systematics of lherzolitic shergottite Yamoto-793605. *Antarct. Meteorite Res.* 14, 47-60.  
Y793605
- Morikawa N., Mikouchi T., Koizumi E., Sukiyama K and Miyamoto M. (2006) Determination of the Fe oxidation state of Chassigny keasurtite: A microXANES spectroscopic study. *Meteoritics & Planet. Sci.* 41, 1321-1329.  
Chassigny
- Morris R.V. (1989) Reflectivity spectra (320-200 nm) of SNC meteorites (abs). *Lunar Planet. Sci.* XX, 719-720. Lunar Planetary Institute, Houston  
Shergotty Zagami ALHA77005 EETA79001
- Morris R.V., Agresti D.G., Sheller T.D. and Wdowiak T.J. (1989) Mössbauer backscatter spectrometer: A new approach for mineralogical analysis on planetary surfaces (abs). *Lunar Planet. Sci.* XX, 723-724. Lunar Planetary Institute, Houston  
EETA79001
- Morris R.V. and eleven authors (2000) Mineralogy, composition, and alteration of Mars Pathfinder rocks and soils: Evidence from multispectral, elemental, and magnetic data on terrestrial analogue, SNC meteorite and Pathfinder samples. *J. Geophys. Res.* 105, 1757-1817.
- Morris and six authors (2006) Magnetite in Martian meteorite MIL03346: Mossbauer - - (abs#1594). *Lunar Planet. Sci. Conf.* XXXVII Lunar Planetary Institute, Houston  
MIL03346
- Morris R.V., McKay G.A., Agresti D.G. and Li L. (2008) Mossbauer and electron microprobe studies of density separates of Martian nakhelite MIL03346: Implications for identification of Mossbauer spectra acquired by the Mars exploration rovers (abs#2458). *Lunar Planet. Sci.* XXXIX. Lunar Planet. Inst. Houston.  
MIL03346
- Mouginis-Mark P.J., McCoy T.J., Taylor G.J. and Keil K. (1992) Martian parent craters for the SNC meteorites. *J. Geophys. Res.* 97, 10,213-10,225.
- Muenow D. W. and Gooding J. L. (1985) "Martian" volatiles in shergottite EETA79001: Possible significance of secondary minerals (abs). *Lunar Planet. Sci.* XVI, 593-594. Lunar Planetary Institute, Houston  
EETA79001
- Müller H.W. and Zähringer J. (1969) Rare gases in stony meteorites. In *Meteorite Research* (ed. Millmann) 845 Reidel, Dordrecht.  
Shergotty
- Müller W. F. (1993) Thermal and deformational history of the Shergotty meteorite deduced from clinopyroxene microstructure. *Geochim. Cosmochim. Acta* 57, 4311-4322.

Shergotty

Münker C., Mezger K. and Bischoff A. (2001) Nb-Zr constraints on early silicate differentiation on Mars. *Meteoritics & Planet. Sci.* 36, A143.

Nakhla Lafayette Chassigny Zagami Shergotty ALH77005 EETA79001 DaG476  
SaU005 ALH84001

Münker C., Pjander J.A., Weyer S., Buchl A., Kleine T. and Mezger K. (20008) Evolution of planetary cores and the Earth-Moon system from Nb/Ta systematics. *Science* 301, 84-87.

Murthy M.V.N., Srivastava S.N.P. and Dube A. (1969) *Indian Meteorites*. Geol. Survey India Mem. Vol. 99. with 30 plates! Calcutta.  
Shergotty

Murty S.V.S., Mohapatra R.K. and Clement C.J. (1995) Nitrogen and noble gas components in the Martian orthopyroxenite ALH84001 (abs). *Lunar Planet. Sci.* XXVI, 1019-1020. Lunar Planetary Institute, Houston  
ALH84001

Murty S.V.S. and Mohapatra R.K. (1997) Nitrogen and heavy noble gases in ALH84001: Signatures of ancient Martian atmosphere. *Geochim. Cosmochim. Acta* 61, 5417-5428.  
ALH84001

Murty S.V.S. and Mohapatra R.K. (1999) Cosmogenic and trapped gas components in the Martian meteorite Dar al Gani 476 from hot desert. In Workshop on Extraterrestrial Materials from Cold and Hot Deserts. LPI Cont. 997. (eds. Schultz *et al.*) Lunar Planetary Institute, Houston.  
DaG476

Murty S.V.S., Mahajan R.R., Das J.P., Sinha N. and Goswami J.N. (2003) Trapped and cosmogenic gas components and nuclear tracks in the nakhlite Y000593 (abs). International Symposium. *Evolution of Solar System: A New Perspective from Antarctic Meteorites*, 90-91. Nat. Inst. Polar Res., Tokyo.  
Y000593

Murty S.V.S., Mohapatra R.K., Goswami J.N. and Sinha N. (1999) Cosmogenic records and trapped gases in the Nakhla meteorite (abs). *Meteoritics & Planet. Sci.* 34, A84-85.  
Nakhla

Murty S.V.S., Mahajan R.R., Goswami J.N. and Sinha N. (2005) Noble gases and nuclear tracks in the Nakhlite MIL03346 (abs#1280). *Lunar Planet. Sci.* XXXVI Lunar Planetary Institute, Houston. (CD-ROM)  
MIL03346

Musselwhite D.M., Drake M.J. and Swindle T.D. (1991) Early outgassing of Mars supported by differential water solubility of iodine and xenon. *Nature* 352, 697-699.

Musselwhite D.M. and Drake M.J. (2000) Early outgassing of Mars: Implications from experimentally determined solubility of iodine in silicate magmas. *Icarus* 148, 160-175.

Musselwhite D.M., Swindle T.D. and Lunine J.I. (2000) Is polar clathrate storage fractionation of the Martian atmosphere the cause of the nakhlite krypton to xenon ration? (abs) *Meteoritics & Planet. Sci.* 35, A115.  
Nakhla

Musselwhite D.M. and Swindle T.D. (2001) Is release of Martian atmosphere from polar clathrate the cause of the nakhlite and ALH84001 Ar/Kr/Xe ratios? *Icarus* 154, 207-215.

Musselwhite D.S. and Jones J.H. (2002a) Calibration of the europium redox indicator at conditions relevant to the Martian meteorites (abs#1712). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)

Musselwhite D.S. and Jones J.H. (2002b) Variation in the augite/melt partitioning of Sm, Eu and Gd with fO<sub>2</sub>: Implications for the oxidation state of the Martian mantle (abs). *Meteoritics & Planet. Sci.* 37, A101.

Musselwhite D.S. and Wadhwa M. (2002c) REE in shergottite augites and whole rocks (abs). Un-mixing SNCs. 41-42. LPI Contribution No. 1134. Lunar Planetary Institute, Houston

Musselwhite D.S. and Jones J.H. (2003a) Oxygen fugacity of the Martian mantle from pyroxene/melt partitioning of REE (abs#2032). *Lunar Planet. Sci. Conf.* XXXIV Lunar Planetary Institute, Houston (CD-ROM).

Musselwhite D.S. and Jones J.H. (2003b) Effects of pyroxene composition on the europium oxybarometer: Implications for the oxygen fugacity of the Martian mantle (abs). *Meteoritics & Planet. Sci.* 38, A131.

Musselwhite D.S., Treiman A.H. and Shearer C. (2005) Light lithophile element trends in Nakhelite NWA817 pyroxenes: Implications for water on Mars (abs#1499). *Lunar Planet. Sci.* XXXVI Lunar Planetary Institute, Houston. (CD-ROM)  
NWA817

Musselwhite D.S. and Treiman A.H. (2005) Experimental petrology of olivine-phyric shergottites: Primary mantle melts? (abs) *Meteoritics & Planet. Sci.* 40, A109.

Mustard J.F. and Sunshine J.M. (1995) Seeing through the dust: Martian crustal heterogeneity and links to the SNC meteorites. *Science* 267, 1623-1626.

Mysen B.O., Virgo D., Popp R.K. and Bertka C.M. (1997) Amphibole inclusions in SNC meteorites: Evidence for a dry Martian interior? (abs) *7th Goldschmidt Conf.*, LPI Contribution 921, 147.

Mysen B.O., Virgo D., Popp R.K. and Bertka C.M. (1998) The role of H<sub>2</sub>O in Martian magmatic systems. *Amer. Mineral.* 83, 942-946.

Nagao K. (1987) Rare gas isotopic composition of achondrites from Antarctica (abs). *NIPR Sym. Antarctic Meteorites* 12th, 49-50. Nat. Inst. Polar Res., Tokyo.  
ALHA77005

Nagao K., Nakamura T., Miura Y.N., Okazaki R. and Takaoka N. (1997a) Noble gas studies of Martian meteorite Yamata 793605 (abs). *Meteoritics & Planet. Sci.* 32, A95-96.  
Y793605

Nagao K., Nakamura T., Miura Y.N. and Takaoka N. (1997b) Noble gas studies of primary igneous materials of Y-793605 (abs). *NIPR Sym. Antarctic Meteorites* 22nd, 131-134. Nat. Inst. Polar Res., Tokyo.  
Y793605

Nagao K., Nakamura T., Miura Y.N. and Takaoka N. (1997c) Noble gas and mineralogy of primary igneous materials of Y-793605 shergottite. *Antarct. Meteorite Res.* 10, 125-142. Nat. Inst. Polar Res., Tokyo.  
Y793605

Nagao K., Nakamura T., Okazaki R., Miura Y.N. and Takaoka N. (1998) Two-stage irradiation of the Y-793605 Martian meteorite (abs). *Meteoritics & Planet. Sci.* 33, A114.  
Y793605

Nagao K. and Okazaki R. (2003) Noble gases of Y980459 shergottite (abs). International Symposium. *Evolution of Solar System: A New Perspective from Antarctic Meteorites*, 82-83. Nat. Inst. Polar Res., Tokyo.  
Y980459

Nagao K., Park J. and Bartoschewitz R. (2006) Terrestrial weathering effects on noble gases of Martian meteorites (abs#1800). *Lunar Planet. Sci. XXXVII*, Lunar Planetary Institute, Houston. (CD-ROM)

Nagao K., Park J. and Choi H. (2007) Noble gases of the Yamato 000027 and Yamato 000097 lherzolitic shergottites. *Antarctic Meteorites XXXI*, 62-63. Nat. Inst. Polar Res., Tokyo.  
Y000097

Nagao K. and Park J. (2008) Nobel gases and cosmi-ray exposure ages of two Martian shergottites, RBT 04262 and LAR 06319 recovered in Antarctica (abs). *Meteoritics & Planet. Sci.* 43, A107.  
RBT04262 LAR06319

Nagao K., Park J. Okazaki R., Imae N. and Kojima H. (2009) Noble gas distributions in the Yamato 000593 Nakhelite deciphered by laser ablation analysis and mineral separation (abs#1682). *Lunar Planet. Sci. XL*, Lunar Planetary Institute, The Woodlands.  
Y000593

Nagata T. (1980a) Magnetic classification of Antarctic meteorites. *Proc. Lunar Planet. Sci. Conf.* 11th, 1789-1799.  
ALHA77005

Nagata T. (1980b) Paleomagnetism of Antarctic achondrites. *Mem. Natl. Inst. Polar Res., Spec. Issue* 17, 233-242.

Nakamura N. and Masuda A. (1973) Chondrites with peculiar rare-earth patterns. *Earth Planet. Sci. Lett.* 19, 429-437.  
Nakhla

Nakamura N., Unruh D.M., Tatsumoto M. and Hutchison R. (1977) Nakhla: further evidence for a young crystallization age (abs). *Meteoritics* 12, 324-325.  
Nakhla

Nakamura N., Unruh D.M. and Tatsumoto M. (1978) The young magmatic event in the Nakhla achondrite parent body. In *Short Papers of the 4th ICOG* (ed. Zartman). *USGS Open file report* 78-701, 305-306.  
Nakhla

Nakamura N., Masuda A., Coffrant D. and Tatsumoto M. (1979) REE abundances and Sm-Nd systematics of Antarctic eucrite, Allan Hills No. 5 (abs). *Meteoritics* 14, 492-493.  
NOT a Martian meteorite!

Nakamura N., Unruh D.M., Tatsumoto M. and Hutchison R. (1982a) Origin and evolution of the Nakhla meteorite inferred from the Sm-Nd and U-Pb systematics and REE, Ba, Sr, Rb abundances. *Geochim. Cosmochim. Acta* 46, 1555-1573.  
Nakhla

Nakamura N., Komi H. and Kagami H. (1982b) Rb-Sr isotopic and REE abundances in the Chassigny

meteorite (abs). *Meteoritics* 17, 257-258.  
Chassigny

Nakamura N., Komi H., Nishiykawa Y. and Pellas P. (1982c) REE abundances in the Chassigny meteorite (abs). *NIPR Sym. Antarctic Meteorites*, 7th , 47-48. Nat. Inst. Polar Res., Tokyo.  
Chassigny

Nakamura N., Yamakawa A., Yamashita K., Kobayashi T., Imae N., Misawa K. and Kojima H. (2002) REE abundances and Rb-Sr age of a new Antarctic nakhelite Yamoto 000593 (abs). *Antarctic Meteorites* XXVII, 112-11. Nat. Inst. Polar Res., Tokyo  
Y000593

Nakamura N., Kobayashi T. and Yamashita K. (2003) REE abundances and Rb-Sr systematics of the Yamato 980459 shergottite: A progress report (abs). International Symposium. *Evolution of Solar System: A New Perspective from Antarctic Meteorites*, 100. Nat. Inst. Polar Res., Tokyo.  
Y980459

Neal C.R. (2000) Issues involved in a Martian sample return: Integrity, preservation and the Curation and Analysis Planning Team for Extraterrestrial Materials (CAPTEM) position. *J. Geophys. Res.* 105, 22,487-22,506.

Neal C.R., Taylor L.A., Ely J.C., Jain J.C. and Nazarov M.A. (2001a) Detailed geochemistry of new Shergottite, Dhofar 019 (abs#1671). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
Dho019

Neal C.R., Ely J.C. and Jain J.C. (2001b) New platinum-group element (PGE) data for Martian meteorites: The influence of igneous processing (abs#1682). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
ALH77005 EETA79001

Nealson K.H. (1997) The limits of life on Earth and searching for life on Mars. *J. Geophys. Res.* 102, 23675-23686.

Nealson K.H., Carr M.H., Clark B.C., Doolittle R.F., Jakosky B.M., Korwek E.L., Pace N.R., Poindexter J. S., Race M.S., Reysenbach A.-L., Schopf J.W. and Stevens T.O. (1997) *Mars Sample Return: Issues and Recomendations*. Space Studies Board, National Research Council, Washington D. C.

Nehru C.E., Prinz M. and Zucker S.M. (1979) Brachina: Origin, melt inclusions and relationship to Chassigny (abs). *Meteoritics* 14, 493-494.  
Chassigny

Nekvasil H. and Filiberto J. (2005) The earth/Mars dichotomy in Mg/Si and Al/Si ratios: Is it real? (abs#1413) *Lunar Planet. Sci.* XXXVI Lunar Planetary Institute, Houston. (CD-ROM)

Nekvasil H., Filiberto J., McCubbin F. and Lindsley D.H. (2005) Combining Chassigny and NWA2737: New constraints on possible parental magmas and crystallization histories (abs). *Meteoritics & Planet. Sci.* 40, A112.  
Chassigny NWA2737

Nekvasil Hanna., Filiberto J., McCubbin F. and Lindsley D.H. (2007) Alkalic parental magmas for chassignites? *Meteoritics & Planet. Sci.* 42, 979-992.  
Chassigny NWA2737

Nekvasil H., McCubbin F., Tosca N.J. and Smirnov A. (2008) Hydrothermal activity on Mars: Can

magmatic waters play a viable role? (abs#1828) *Lunar Planet. Sci.* XXXIX Lunar Planetary Institute, Houston. (CD-ROM)  
Chassigny MIL03346

Nelson M.J., Newsom Horton E. and Draper David S. (2005) Incipient hydrothermal alteration of basalts and the origin of Martian soil. *Geochim. Cosmochim Acta* 69, 2701-2711.

Nevle R. J. (1987) Phosphates in Shergotty and EETA79001: Geochemistry and petrogenesis (abs). *Lunar Planet. Sci.* XVIII, 714-715. Lunar Planetary Institute, Houston.  
Shergotty EETA79001

Newsom Horton.E. (1980) Hydrothermal alteration of impact melt sheets with implications for Mars. *Icarus* 44, 207-216.

Newsom H.E. and Drake M.J. (1987) Formation of the Moon and terrestrial planets: Constraints from V, Cr and Mn abundances in planetary mantles and from new partitioning experiments (abs). *Lunar Planet. Sci.* XVIII, 716-717. Lunar Planetary Institute, Houston

Newsom H.E., Shearer C.K. and Treiman A.H. (2001) Mobile elements determined by SIMS analysis in hydrous alteration materials in the Lafayette Martian meteorite (abs#1396). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
Lafayette

Niekerk Deon, Goodrich C.A. aand Taylor G.J. and Keil K. (2007) Characterization of the lithological contact in the shergottite EETA79001-A record of igneous differentiation processes on Mars. *Meteoritics & Planet. Sci.* 42, 1751-1762.  
EETA79001

Nichiporuk W., Chodos A., Helin E. and Brown H. (1967) Determination of iron, nickel, cobalt, calcium, chromium and manganese in stony meteorites by X-ray fluorescence. *Geochim. Cosmochim. Acta* 31, 1911-1930.  
Lafayette

Niles P.B., Leshin L.A., Guan Y. and Hervig R.L. (2002) Carbon isotopic compositions of ALH84001 carboantes: An ion microprobe study (abs#1655). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)  
ALH84001

Niles P.B., Zolotov M.Y. and Leshin L.A. (2006) The role of CO<sub>2</sub> in aqueous alteration of ultra-mafic rocks and the formation of Mg-, Fe-rich aqueous solutions on early Mars (abs#1440). *Lunar Planet. Sci.* XXXVII Lunar Planetary Institute, Houston. (CD-ROM)

Niles P.B., Leshin L.A., Golden D.C., Socki R.A., Guan Y. and Ming D.W. (2005a) Modeling chemical and isotopic variations in lab formed hydrothermal carbonates (abs#1499). *Lunar Planet. Sci.* XXXVI, Lunar Planetary Institute, Houston. (CD-ROM)

Niles P.B., Leshin L.A. and Guan Y. (2005b) Microscale carbon isotopic variability in ALH84001 carbonates and a discussion of possible formation environments. *Geochim. Cosmochim. Acta* 69, 2931-2944.  
ALH84001

Nininger H.H. (1935) The Lafayette meteorite. *Popular Astronomy* 43, 404.  
Lafayette

Nishiizumi K. (1987) <sup>53</sup>Mn, <sup>26</sup>Al, <sup>10</sup>Be and <sup>36</sup>Cl in meteorites: Data compilation. *Nucl. Tracks Radiat.*

*Meas.* 13, 209-273.

- Nishiizumi K. (1997) Exposure history of shergottite Yamato 793605 (abs). *NIPR Symp. Martian Meteorites* 22nd, 149-151. Nat. Inst. Polar Res., Tokyo.  
Y793605
- Nishiizumi K. (2001) Surficial studies of Mars using cosmogenic nuclides. *Workshop on the Martian highlands and Mojave desert analogs*. Lunar Planetary Institute, Houston
- Nishiizumi K., Arnold J.R., Goswami N., Klein J. and Middleton R. (1986a) Solar cosmic ray effects in ALHA77005 (abs). *Meteoritics* 21, 472-473.  
ALHA77005
- Nishiizumi K., Klein J., Middleton R., Elmore D., Kubik P.W. and Arnold J.R. (1986b) Exposure history of shergottites. *Geochim. Cosmochim. Acta* 50, 1017-1021.  
Shergotty ALHA77005 EETA79001
- Nishiizumi K., Elmore D. and Kubik P.W. (1989) Update on terrestrial ages of Antarctic meteorites. *Earth Planet. Sci. Lett.* 93, 299-313.  
ALHA77005 ALH84001 EETA79001
- Nishiizumi K., Arnold J.R., Caffee M.W., Finkel R.C. and Sounthor J. (1992) Exposure histories of Calalong Creek and LEW88516 meteorites (abs). *Meteoritics* 27, 270.  
LEW88516
- Nishiizumi K., Caffee M.W. and Finkel R.C. (1994) Exposure histories of ALH84001 and ALHA77005. (abs). *Meteoritics* 29, 511.  
ALH84001 ALHA77005
- Nishiizumi K. and Caffee M.W. (1996) Exposure history of shergottite Queen Alexandra Range 94201 (abs). *Lunar Planet. Sci. XXVII*, 961-962. Lunar Planetary Institute, Houston  
QUE94201
- Nishiizumi K., Masarik J., Welton K.C., Caffee M.W., Jull A.J.T. and Klandrud S.E. (1999) Exposure history of new Martian meteorite Dar al Gani 476 (abs#1966). *Lunar Planet. Sci. XXX* Lunar Planetary Institute, Houston (CD-ROM).  
DaG476
- Nishiizumi K., Caffee M.W. and Masarik J. (2000) Cosmogenic radionuclides in the Los Angeles Martian meteorite (abs). *Meteoritics & Planet. Sci.* 35, A120.  
Los Angeles
- Nishiizumi K., Caffee M.W., Jull A.J.T. and Klandrud S.E. (2001) Exposure history of shergottites Dar al Gani 476/489/670/735 and Sayh al Uhaymir 005 (abs#2117). *Lunar Planet. Sci. XXXII* Lunar Planetary Institute, Houston. (CD-ROM)  
DaG476 SaU005
- Nishiizumi K., Okazaki R., Park J., Nagao K., Masarik J. and Finkel R.C. (2002) Exposure and terrestrial histories of Dhofar 019 Martian meteorite (abs#1366). *Lunar Planet. Sci. XXXIII* Lunar Planetary Institute, Houston. (CD-ROM)  
Dho019
- Nishiizumi K. and Hillegonds D.J. (2004) Exposure and terrestrial histories of new Yamato lunar and Martian meteorites (abs). *Antarctic Meteorites XXVIII* Nat. Inst. Polar Res., Tokyo.  
Y000593 Y980459

- Nishiizumi K., Hillegonds D.J., McHargue L.R. and Jull A.J.T. (2004) Exposure and terrestrial histories of lunar and Martian meteorites (abs#1130). *Lunar Planet. Sci.* XXXV Lunar Planetary Institute, Houston. (CD-ROM)  
NWA998 NWA1110 NWA1195 NWA1460
- Nishiizumi K. and Caffee M.W. (2006) Constraining the number of lunar and Martian meteorite falls (abs). *Meteoritics & Planet. Sci.* 41, A133.  
NWA1195 NWA2046 NWA2626 NWA1068 NWA1110 NWA2646 NWA3171 GRV99027
- Noguchi T., Imae N., Misawa K. and Nakamura T. (2003) Mineralogy of “iddingsite” and symplectite in Y000593 and 000749: Implication for their post-crystallization and aqueous alteration (abs). International Symposium. *Evolution of Solar System: A New Perspective from Antarctic Meteorites*, 105-106. Nat. Inst. Polar Res., Tokyo.  
Y980459 Y000749
- Noll K., Doebele M., Tobler L., Grambole D. and Krähenbühl U. (1997) Flourine profiles in achondrites and chondrites from Antarctica by Nuclear Reaction Analysis (NRA) (abs). *Meteoritics & Planet. Sci.* 32, A101.  
ALH84001
- Norman M.D. (1999) The composition and thickness of the crust of Mars estimated from rare earth elements and neodymium-isotopic compositions of Martian meteorites. *Meteoritics & Planet. Sci.* 34, 439-449.
- Norris J.R. and Herd C.D.K. (2006) The Yamato 980459 liquidus at 10 to 20 kilobars (abs#1787). *Lunar Planet. Sci. Conf.* XXXVII Lunar Planetary Institute, Houston (CD-ROM)
- Norton R.D. (1994) *Rocks from Space: Meteorites and Meteorite Hunters*. 449 pages, Mountain Press, Missoula.
- Norton O.R. (2002) *The Cambridge Encyclopedia of Meteorites*. 354 pages, Cambridge Univ. Press, Cambridge.
- Nyquist L.E. (1983a) Do oblique impacts produce Martian meteorites? *Proc. Lunar Planet. Sci. Conf.* 13th, *J. Geophys. Res.* 88, A785-A798.
- Nyquist L.E. (1983b) Meteorites from Mars - A status report (abs). *Meteoritics* 18, 367-368.
- Nyquist L.E. (1983c) The oblique impact hypothesis (abs). *Lunar Planet. Sci. XIV*, 574-575. Lunar Planetary Institute, Houston
- Nyquist L.E. (1984) The oblique impact hypothesis and relative probabilities of lunar and Martian meteorites. *J. Geophys. Res.* 89, B631-B640.
- Nyquist L.E., Shih C.-Y., Bansal B.M., Wooden J., Wiesmann H. and McKay G.A. (1978a) Rb-Sr and Sm-Nd chronology of the Shergotty achondrite. In *Short Papers of the 4th ICOG*. (ed. Zartman) *USGS Open file report* 78-701, 315-317.  
Shergotty
- Nyquist L.E., Wooden J., Bansal B.M. and Wiesmann H. (1978b) A shocking Rb/Sr age for the Shergotty achondrite (abs). *Lunar Planet. Sci. IX*, 820-822. Lunar Planetary Institute, Houston  
Shergotty
- Nyquist L.E., Bogard D.D., Wooden J., Wiesmann H., Shih C.-Y. and Bansal B.M. (1979a) Early

differentiation, late bombardment and recent bombardment on the shergottite parent planet (abs).  
*Meteoritics* 14, 502.  
Shergotty Zagami ALHA77005

Nyquist L.E., Wooden J., Bansal B., Wiesmann H., McKay G.A. and Bogard D.D. (1979b) Rb-Sr age of the Shergotty achondrite and implications for the metamorphic resetting of isochron ages. *Geochim. Cosmochim. Acta* 43, 1057-1074.  
Shergotty

Nyquist L.E., Wooden J., Bansal B., Wiesmann H. and Shih C.-Y. (1984) Sr and Nd isotopic systematics of EETA79001 (abs). *Meteoritics* 19, 284.  
EETA79001

Nyquist L.E., Wiesmann H., Shih C.-Y. and Bansal B. (1986) Sr isotopic systematics of EETA79001 glass (abs). *Lunar Planet. Sci.* XVII, 624-625. Lunar Planetary Institute, Houston  
EETA79001

Nyquist L.E., Hörz F., Wiesmann H., Shih C.-Y. and Bansal B. (1987a) Isotopic studies of shergottite chronology: I. Effect of shock metamorphism on the Rb-Sr system (abs). *Lunar Planet. Sci.* XVIII, 732-733. Lunar Planetary Institute, Houston

Nyquist L.E., Bansal B., Wiesmann H., Shih C.-Y. and McKay G. (1987b) Isotopic studies of shergottite chronology: II. Possible effect of contamination on the Sm-Nd system (abs). *Lunar Planet. Sci.* XVIII, 730-731. Lunar Planetary Institute, Houston

Nyquist L.E., Harper C. L., Wiesmann H., Bansal B. and C.-Y. Shih (1991)  $^{142}\text{Nd}/^{144}\text{Nd}$  in SNCs and lunar samples: Implications for early differentiation of a heterogeneous Martian (?) mantle (abs).  
*Meteoritics* 26, 381.  
Shergotty Zagami ALHA77005 EETA79001 Nakhla Lafayette Governador Valadares Chassigny

Nyquist L.E., Bansal B., Wiesmann H. and C.-Y. Shih (1995) "Martians" young and old: Zagami and ALH84001 (abs). *Lunar Planet. Sci.* XXVI, 1065-1066. Lunar Planetary Institute, Houston  
Zagami ALH84001

Nyquist L.E., Borg L. E. and Shih C.-Y. (1997) The shergottite age paradox (abs). In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life.* (eds. Clifford et al.) *LPI Contribution* 916, 64. Lunar Planetary Institute, Houston.  
EETA79001 Zagami

Nyquist L.E., Bogard D.D., Garrison D.H. and Reese Y. (1998a) A single-crater origin for Martian Shergottites: Resolution of the age paradox? (abs#1688) *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).

Nyquist L.E., Borg L.E. and Shih C.-Y. (1998b) The shergottite age paradox and the relative probabilities for Martian meteorites of differing ages. *J. Geophys. Res.* 103, 31,445-31,455.

Nyquist L.E., Reese Y.D., Wiesmann H., Shih C-Y. and Schwandt C. (2000) Rubidium-strontium age of the Los Angeles Shergottite (abs). *Meteoritics & Planet. Sci.* 35, A121-122.  
Los Angeles

Nyquist L.E., Bogard D.D., Shih C-Y., Greshake A., Stoffler D. and Eugster O. (2001a) Ages and geologic histories of Martian meteorites. In *Chron. & Evol. of Mars* (ISSI) 96, 105-164. Kluwer Academic Publishers. The Netherlands. (a review)

Nyquist L.E., Bogard D.D. and Shih C-Y. (2001b) Radiometric chronology of the Moon and Mars. *In The Century of Space Science*. Vol. II, ch. 55, 1325-1376. (ed. Bleeker, Geiss and Huber) Kluwer Academic Publishers. The Netherlands. (a review) [www.thecenturyofspacescience.com](http://www.thecenturyofspacescience.com)

Nyquist L.E., Reese Y., Wiesmann H. and Shih C.-Y. (2001c) Age of EET79001B and implications for shergottite origins (abs#1407). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston (CD-ROM)  
EETA79001

Nyquist L.E., Shih C.-Y., Wiesmann H. and Barrat J.A. (2002) An “andesitic” component in shergottites with restored LREE abundances? (abs) Un-mixing SNCs. 43-44. LPI Contribution No. 1134. Lunar Planetary Institute, Houston

Nyquist L.E., Shih C.-Y., Reese Y.D. and Irving A.J. (2006a) Concordant Rb-Sr and Sm-Nd ages for NWA1460: A 340 Ma old basaltic shergotite related to lherzolitic shergottites (abs#1723). *Lunar Planet. Sci. Conf.* XXXVII Lunar Planetary Institute, Houston  
NWA1460

Nyquist Larry, Ikeda Y., Shih C.-Y., Reese Y.D., Nakamura N. and Takeda H. (2006b) Sm-Nd age and Nd- and Sr- isotopic evidence for the petrogenesis of Dhofar 378 (abs). *Antarctic Meteorites* XXX, 59-60. Nat. Inst. Polar Res., Tokyo.  
Dhofar378

Ocker K.D. and Gilmour J.D. (2001a) Martian atmospheric Xenon and Martian ‘interior’ Xenon components in Martian meteorites (abs#1782). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)

Ocker K.D. and Gilmour J.D. (2001b) Martian atmospheric and ‘interior’ Xenon components in Shergotty mineral separates. *Meteoritics & Planet. Sci.* 36, A152.

Ocker K.D. and Gilmour J.D. (2002) Martian atmospheric and interior xenon components in EETA79001 lith-B mineral separates (abs#1603). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)  
EETA79001

Ocker K.D., Holland G. and Gilmour J.D. (2002) Evolution of Martian atmospheric, crustal, and mantle Xenon components in basaltic shergottites (abs). Un-mixing SNCs. 45-46. LPI Contribution No. 1134. Lunar Planetary Institute, Houston

Oe K., McKay G. and Le L. (2001) REE and strontium partition coefficients for Nakhla pyroxenes (abs#2174). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
Nakhla

Oe K., McKay G., Le L., Miyamoto M. and Mikouchi T. (2002) REE and Sr partition coefficients for Nakhla pyroxenes: Their relationships to other element abundance (abs#2065). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)  
Nakhla

Okazaki R., Nagao K., Imae N. and Kojima H. (2002) Noble gases in Antarctic naklites, Yamato 000593 and Yamota 000749 (abs). *Antarctic Meteorites* XXVII, 134-136. Nat. Inst. Polar Res., Tokyo  
Y000593 Y000749

Okazaki R., Nagao K., Imae N. and Kojima H. (2003) Noble gas signatures of Antarctic naklites, Yamato (Y) 000593, Y000749, and Y000802. *Antarct. Meteorite Res.* 16, 58-79. Nat. Inst. Polar Res., Tokyo.

Y000593 Y000749 Y000802

Okazaki R. and Nagao K. (2004) Noble gases of Yamato 980459 shergottite. *Antarct. Meteorite Res.* 17, 68-83. Nat. Inst. Polar Res., Tokyo.  
Y980459

O'Keefe J.D. and Ahrens T.J. (1983) Constraints on the impact-on-Mars origin of SNC meteorites (abs). *Lunar Planet. Sci.* XIV, 578-579. Lunar Planetary Institute, Houston

O'Keefe J.D. and Ahrens T.J. (1986) Oblique impact: A process for obtaining meteorite samples from other planets. *Science* 234, 346-349.

O'Neill C., Ikeda Y. and Delaney J.S. (1987) The compositional zoning of feldspathic phases in Allan Hills 77005,32 (abs). *Lunar Planet. Sci.* XVIII, 750-751. Lunar Planetary Institute, Houston  
ALHA77005

Onuma N. and Hirano M. (1981) Sr/Ca-Ba/Ca systematics in Antarctic Ca-rich achondrites and their origins. *Proc. 6th Sym. Antarctic Meteorites. Mem. Natl. Inst. Polar Res. Spec. Iss.* 20, 211-220. Nat. Inst. Polar Res., Tokyo.  
ALHA77005

Oró J. (1998) The case for life on Mars, part 1: an "open" skeptical view. *BioAstronomy News* 10, 1-6.

Oró J. (1999) The case for life on Mars, data are as good as our interpretations. *BioAstromomy News* 10, 1-4.

Ostertag R., Amthauer G. and McSween H.Y. (1983) Fe<sup>3+</sup> in shocked olivine crystals of the ALHA77005 meteorite (abs). *Meteoritics* 18, 368-369.  
ALHA77005

Ostertag R., Amthauer G., Rager H. and McSween H.Y. (1984) Fe<sup>3+</sup> in shocked olivine crystals of the ALHA77005 meteorite. *Earth Planet. Sci. Lett.* 67, 162-166.  
ALHA77005

Ostertag R., Stöffler D., James C. and Phannschmidt G. (1985) Shock effects in the Shergotty meteorite - Evidence for only one shock event (abs). *Lunar Planet. Sci.* XVI, Suppl. A, 19-20. Lunar Planetary Institute, Houston.  
Shergotty

O'Sullivan K.M. and Neal C.R. (2009) The crystal strigraphy of Shergotty (abs#1709). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.  
Shergotty

Ott U. (1988) Noble gases in SNC meteorites: Shergotty, Nakhla, Chassigny. *Geochim. Cosmochim. Acta* 52, 1937-1948.  
Shergotty Nakhla Chassigny

Ott U. (1991) Composition of the Martian atmosphere. *Space Science Reviews* 56, 23-29.

Ott U. (2008) An almost infinite sink for tightly bound xenon: Etched Shergotty and (less so) etched Nakhla (abs#1096). *Lunar Planet. Sci.* XXXIX Lunar Planetary Institute, Houston. (CD-ROM)  
Shergotty Nakhla

Ott U., Begemann F. and Löhr H.-P. (1983) Noble gases in the Brachina and Chassigny meteorites (abs). *Lunar Planet. Sci.* XIV, 586-587. Lunar Planetary Institute, Houston.

Chassigny

Ott U. and Begemann F. (1985a) Martian meteorites: Are they (all) from Mars: Evidence from trapped noble gases (abs). *Meteoritics* 20, 721-722.

Ott U. and Begemann F. (1985b) Are all the “Martian” meteorites from Mars? *Nature* 317, 509-512.  
Shergotty Nakhla Chassigny EETA79001

Ott U., Löhr H.-P. and Begemann F. (1985) Noble gases and the classification of Brachina. *Meteoritics* 20, 69-78.

Ott U., Löhr H.-P. and Begemann F. (1988) New noble gas data for SNC meteorites: Zagami, Lafayette and etched Nakhla (abs). *Meteoritics* 23, 295-296.  
Zagami Lafayette Nakhla

Ott U. and Löhr H.-P. (1992) Noble gases in the new shergottite LEW88516 (abs). *Meteoritics* 27, 271.  
LEW88516

Ott U., Löhr H.-P. and Begemann F. (1996) Etching and crushing SNCs: More noble gas data (abs).  
*Meteoritics & Planet. Sci.* 31, A103.  
Nakhla LEW88516

Oura Y., Shirai N. and Ebihara M. (2002) Chemical composition of Y000593 and Y000749 (abs).  
*Antarctic Meteorites* XXVII, 143-145. Nat. Inst. Polar Res., Tokyo  
Y000593 Y000749

Oura Y., Shirai N. and Ebihara M. (2003) Chemical composition of Yamato (Y) 000593 and Y000749:  
Neutron-induced prompt gamma-ray analysis study. *Antarct. Meteorite Res.* 16, 80-93. Nat. Inst.  
Polar Res., Tokyo.  
Y000593 Y000749

Owen T., Maillard J.P., De Bergh C. and Lutz B.L. (1988) Deuterium on Mars: The abundance of HDO  
and the value of D/H. *Science* 240, 1767-1770.

Pal D.K., Tuniz C., Moniot R.K., Savin W., Druse T. and Herzog G.F. (1986) Beryllium-10 contents of  
shergottites, nakhrites, and Chassigny. *Geochim. Cosmochim. Acta* 50, 2405-2409.  
Chassigny Shergotty Zagami ALHA77005 EETA79001 Nakhla Lafayette Governador  
Valadares

Palme H. (1985) Rare and unique meteorites from Antarctica. In *International workshop on Antarctic  
meteorites.* (ed. Annexstad) *LPI Tech. Rpt.* 86-1, 77-79. Lunar Planetary Institute, Houston.

Palme H., Borisov A. and Holzheid A. (1997) The significance of highly siderophile elements during  
planetary differentiation (abs). *Meteoritics & Planet. Sci.* 32, A103.

Pan V., Holloway J.R. and Bertka C.M. (1991) The role of CO<sub>2</sub> in the formation of the nakhrites:  
metasomatism in the Martian mantle? (abs) *Lunar Planet. Sci.* XXII, 1017-1018. Lunar Planetary  
Institute, Houston.

Papanastassiou D.A. and Wasserburg G.J. (1974) Evidence for late formation and young metamorphism in  
the achondrite Nakhla. *Geophys. Res. Lett.* 1, 23-26.  
Nakhla

Papike J.J. (1996) Pyroxene as a recorder of cumulate formational processes in Asteroids, Moon, Mars,  
Earth: Reading the record with the ion microprobe. *Amer. Mineral.* 81, 525-544.

Papike J.J. ed. (1998) Planetary Materials. *Reviews of Mineralogy* 36. Mineralogical Society of America.

Papike J.J., Fowler G.W., Layne G.D., Spilde M.N. and Shearer C.K. (1994) ALH84001 A “SNC orthopyroxenite”: Insights from SIMS analysis of orthopyroxene and compositions to diogenites (abs). *Lunar Planet. Sci.* XXV, 1043-1044. Lunar Planetary Institute, Houston  
ALH84001

Papike J.J., Kramer J.M. and Shearer C.K. (2003) Determination of planetary basalt parentage: A simple technique using the electron microprobe (abs#1018). *Lunar Planet. Sci.* XXXIV Lunar Planetary Institute, Houston.

Papike J.J., Shearer C.K. and Burger P.V. (2009) Pyroxene mineralogy of martian meteorites (abs#1180). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.

Pätzsch M., Altmaier M., Herpers U., Kosuch H., Michel R. and Schultz L. (2000) Exposure age of the new SNC meteorite Sayh al Uhaymir 005 (abs). *Meteoritics & Planet. Sci.* 35, A124-125.  
SaU005

Park Jisun, Okazaki R., and Nagao K. (2001) Noble gases in SNC meteorites: Dar al Gani 489, Sayh al Uhaymir 005 and Dhofar 019 (abs). *Meteoritics & Planet. Sci.* 36, A121-122.  
DaG489 SaU005 Dho019

Park J., Okazaki R. and Nagao K. (2003a) Noble gas studies of Martian meteorites: Dar al Gani 476/489, Sayh al Uhaymir 005/060, Dhofar019, Los Angeles 001and Zagami (abs#1213). *Lunar Planet. Sci.* XXXIV. Lunar Planetary Institute, Houston.  
DaG476 DaG489 SaU005 SaU060 Dho019 LosAngeles Zagami

Park J. and Nagao K. (2003b) Noble gas studies of Dhofar 378 Martian meteorite (abs). *Meteoritics & Planet. Sci.* 38, A79.  
Dho378

Park J. and Nagao K. (2006) New insights on Martian atmospheric Neon from Martian meteorite, Dhofar 378 (abs#1110). *Lunar Planet. Sci. Conf.* XXXVII Lunar Planetary Institute, Houston.  
Dho378

Park J. and Bogard Don (2006) Ar-Ar dating of Martian meteorite Dhofar 378: an early shock event? (abs) *Antarctic Meteorites* XXX, 59-60. Nat. Inst. Polar Res., Tokyo.  
Dho378

Park J. and Bogard D.D. (2007) 39Ar-40Ar “age” of basaltic shergottite NWA3171 (abs#5015). *Meteoritics & Planet. Sci.* 42, A122.  
NWA3171

Park J. and Bogard D.D. (2008) 39Ar-40Ar dating of Martian shergottite, DaG476 (abs#1204). *Lunar Planet. Sci. Conf.* XXXIX Lunar Planetary Institute, Houston.  
DaG476

Park J., Garrison D.H. and Bogard D.D. (2008) 39Ar-40Ar ages of the Nakhrites: A synthesis (abs). *Meteoritics & Planet. Sci.* 43, A127.  
MIL03346 Lafayette Y000539 Nakhla Governdor Valadares

Park J., Bogard D.D., Mikouchi T. and McKay G.A. (2008) Dhofar 378 Martian shergottite: Evidence of early shock melting. *J. Geophys. Res.* 113, E08007.  
Dho378

- Pasteris J.D. and Wopenka B. (2003) Necessary, but not sufficient: Raman identification of disordered carbon as a signature of ancient life. *Astrobiology* 3, 727-737.  
ALH84001
- Pellas Paul (1987) Are SNC meteorite samples from Mars? *Bull. Soc. Geologique de France* 3, 21-29.
- Pepin Robert O. (1985) Evidence of Martian origins. *Nature* 317, 473-475.  
EETA79001
- Pepin R.O. (1987) Volatile inventories of the terrestrial planets. *Rev. Geophys.* 25, 293-296.
- Pepin R.O. (1991) On the origin and early evolution of terrestrial planet atmospheres and meteoritic volatiles. *Icarus* 92, 2-79.
- Pepin R.O. (1992) Origin of noble gases in the terrestrial planets. *Ann. Rev. Earth Planet. Sci.* 20, 389-430. (*review paper*)
- Pepin R.O. (1994) Evolution of the Martian atmosphere. *Icarus* 111, 289-304.
- Pepin R.O. (2000) Xenon in the primordial Martian atmosphere (abs). *Meteoritics & Planet. Sci.* 35, A126.
- Pepin R.O. and Becker R.H. (1983) Noble gases in EETA79001 (abs). *Meteoritics* 18, 375-376.  
EETA79001
- Pepin R.O. and Becker R.H. (1984) Galactic-cosmic-ray exposure histories of the Antarctic shergottite EETA79001 (abs). *Lunar Planet. Sci.* XV, 637-638. Lunar Planetary Institute, Houston  
EETA79001
- Pepin R.O., Becker R.H. and Wiens R.C. (1985) Review of relative and absolute abundances of atmophilic gases in glass from the EETA79001 shergottite, and comparison with the Martian and terrestrial atmospheres (abs). *Meteoritics* 20, 728-729.  
EETA79001
- Pepin R.O. and Becker R.H. (1985) Noble gas patterns in the atmospheres of Mars and Earth: A comparison via the SNC meteorites (abs). In *Terrestrial Planets: Comparative Planetology*, 2. *LPI Tech. Rpt.* Lunar Planetary Institute, Houston.
- Pepin R.O. and Carr M.H. (1992) Major issues and outstanding questions. In *Mars* (eds. Kieffer *et al.*), pp. 120-143. Univ. Arizona Press, Tucson.
- Pepin R.O. (2002) Noble gases in the terrestrial planets, with focus on what the SNC meteorites tell us about Mars (abs). Un-mixing SNCs .4 7-48. LPI Contribution No. 1134. Lunar Planetary Institute, Houston
- Philpotts J.A. and Schnetzler C.C. (1970) Apollo 11 lunar samples: K, Rb, Sr, Ba and rare-earth concentrations in some rocks and separated phases. *Proc. Apollo 11 Lunar Science Conf.* 1471-1486. Shergotty
- Pieters C.M., Dyar M.D., Hiroi T., Lane M.D., Treiman A., McCanta M., Bishop J.L. and Sunshine J. (2006) Optical properties of Martian dunite NWA2737: A record of Martian processes (abs#1634). *Lunar Planet. Sci. Conf.* XXXVII Lunar Planetary Institute, Houston  
NWA2737

- Pillinger C.T. (1984) Light element stable isotopes in meteorites - from grams to picograms. *Geochim. Cosmochim. Acta* 48, 2739-2766.
- Pillinger C.T., Grady M.M. and Wright I.P. (1991) Light elements and their isotopes in SNC meteorites and the Martian atmosphere. *Space Science Reviews* 56, 31-35. (review paper)
- Pilcher C. (1999) "Martian Meteorites: Where do we stand and where are we going?" *Meteoritics & Planet. Sci.* 34, 3-4. editorial
- Pinson W.H., Schnetzler C.C., Beiser E., Fairbairn H.W. and Hurley P.M. (1965) Rb-Sr age of stony meteorites. *Geochim. Cosmochim. Acta* 29, 455-466.  
Nakhla
- Pistollet (1816) The circumstances of the Chassigny meteorite shower. *Ann. Chim. Phys. (Paris)* 1, 45-48.  
Chassigny
- Plumlee G. S., Ridley W. I., DeBraal J. D. and Reed M. H. (1993) The mineralogical evolution of the Martian surface through time: Implications from chemical reaction-path modeling studies (abs). In *Mars: Past present and future - results from the MSATT program.* (ed. Haberle) *LPI Tech. Rpt.* 93-06, Lunar Planetary Institute, Houston.
- Podosek F. A. (1973) Thermal history of the nakhrites by the  $^{40}\text{Ar}/^{39}\text{Ar}$  method. *Earth Planet. Sci. Lett.* 19, 135-144.  
Lafayette Nakhla
- Podosek F. A. and Hunke J.C. (1973) Argon 40 - argon 39 chronology of four calcium-rich achondrites. *Geochim. Cosmochim. Acta* 37, 667-684.  
Lafayette
- Pollack J.B., Kasting J.F., Richardson S.M. and Poliakkoff K. (1987) The case for a wet, warm climate on early Mars. *Icarus* 71, 203-224.
- Prewitt C.T., Dera P., Boctor N.Z. and Hemley R.J. (2001) High-pressure phase of silica from the Martian meteorite Shergotty (abs). *Eleventh Goldschmidt Conf.* 3077. Hot Springs.
- Prinz M., Hlava P.H. and Keil K. (1974) The Chassigny meteorite: A relatively iron-rich cumulate dunite (abs). *Meteoritics* 9, 393-394.  
Chassigny
- Prior G.T. (1912) The meteoritic stones of El Nakhla El Baharia (Egypt). *Min. Mag.* XVI, 274-281.  
Nakhla
- Protheroe W.J. and Sterling J. (1998) Cathodoluminescence study of fragments of the Martian meteorite ALH84001 (abs#1569). *Lunar Planet. Sci. XXIX* Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001
- Protheroe W.J. and Stirling J. (2000a) Cathodoluminescence analysis of Mars meteorites (abs#1980). *Lunar Planet. Sci. XXXI* Lunar Planetary Institute, Houston (CD-ROM).
- Protheroe W.J. and Stirling J. (2000b) Preliminary results of cathodoluminescence spectral analysis of beta-Ca-phosphates ("Whitlockite") in the Mars meteorite ALH84001 (abs#2021). *Lunar Planet. Sci. XXXI* Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001
- Protheroe W.J., Venance K. and Stirling J.A.R. (2001a) Cathodoluminescence analysis of Nakhla 1401

chloroapatites (abs#1638). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
Nakhla

Protheroe W.J., Venance K. and Stirling J.A.R. (2001b) Nakhla 1911-369 chloroapatites (abs#1642).  
*Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
Nakhla

Puchtei I.S., Walker R.J., Brandon A.D. and Irving A.J. (2008) Highly siderophile element abundances in SNC meteorites: An update (abs#1650). *Lunar Planet. Sci.* XXXIX Lunar Planetary Institute, Houston (CD-ROM).

ALH77005 LEW88516 SaU008 SaU094 NWA1195 Y980459 DaG476 EETA79001  
NWA1068 Dho019

Puga E., Jagoutz E., Nieto J.M., Diaz de Federico A. and Ruiz-Cruz M. D. (1998) On the origin of the brown color in ALHA77005 olivine (abs#1375). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
ALHA77005

Race M.S. (1996) Planetary protection: Legal ambiguity and the decision making process for Mars Sample Return. *Adv. Space Res.* 18, 345-350.

Rajan R.S., Rambaldi E., Tamhane A.S. and Poupeau G. (1984) Possible neutron effects in the Elephant Moraine shergottite (abs). *Meteoritics* 19, 293-294.  
EETA79001

Rajan R.S. and Lugmair G.W. (1985) Search for neutron effects in the Elephant Moraine shergottite (abs). *Lunar Planet. Sci.* XVI, 681-682. Lunar Planetary Institute, Houston  
EETA79001

Rajan R.S., Lugmair G.W., Tamhane A.S. and Poupeau G. (1986) Nuclear tracks, Sm isotopes and neutron capture effects in the Elephant Moraine shergottite. *Geochim. Cosmochim. Acta* 50, 1039-1042.  
EETA79001

Rao M.N. (1986) Rare gases in Shergotty maskelynite (abs). *Meteoritics* 21, 488.  
Shergotty

Rao M.N., Wentworth S.J., Yang S.-R. and McKay D.S. (1998) Records of molten Martian soil in EET 79001 meteorite (abs#1524). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
EETA79001

Rao M.N., Schwandt C. and McKay D.S. (1999a) Trapped argon and xenon in EETA79001 and ALH84001: Clues to low temperature aqueous activity on Mars (abs#1389). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001 EETA79001

Rao M.N., Wentworth S.J., Schwandt C., Yang S.R. and McKay D.S. (1999b) Molten Martian soil in Shergotty meteorite (abs#1626). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM).  
Shergotty

Rao M.N., Borg L.E., McKay D.S. and Wentworth S.J. (1999c) Martian soil component in impact glasses in a Martian meteorite. *Geophys. Res. Letters* 26, 3265-3268.

EETA79001

Rao M.N. and McKay D.S. (2002a) Martian soil records in Shergotty glass veins (abs). *Meteoritics & Planet. Sci.* 37, A121.

Rao M.N. and McKay D.S. (2002b) Shergottite impact melt glasses contain soil from Martian uplands (abs). Un-mixing SNCs. 49-50. LPI Contribution No. 1134. Lunar Planetary Institute, Houston

Rao M.N., Bogard D.D., Nyquist L.E., McKay D.S. and Masarik J. (2002c) Neutron capture isotopes in the Martian regolith and implications for the Martian atmospheric Noble gases. *Icarus* 156, 352-372.

Rao M.N. and McKay D.S. (2003) Characterization of Martian soil fines fraction in SNC meteorites (abs#1252). *Lunar Planet. Sci. Conf.* 34rd , Lunar Planetary Institute, Houston (CD-ROM).  
EETA79001

Rao M.N., Sutton S.R. and McKay D.S. (2005a) Evaporation evolution of Martian brines based on halogens in nakhlites and MER samples (abs#1358). *Lunar Planet. Sci. XXXVI* Lunar Planetary Institute, Houston. (CD-ROM)

Rao M.N., Sutton S.R., McKay D.S. and Dreibus G. (2005b) Clues to Martian brines based on halogens in salts from nakhlites and MER samples. *J. Geophys. Res.* 110, E12S06, doi:10.1029/205JE002470 Nakhlite

Rao M.N., McKay D.S., Wentworth S.J. and Garrison D.H. (2006) Martian brines: Clues from sulfur and chlorine in salts from some Martian meteorites and MER samples (abs#1969). *Lunar Planet. Sci. Conf.* XXXVII Lunar Planetary Institute, Houston. (CD-ROM)

Rao M.N., Nyquist L.E., Bogard D.D., Garrison D.H. and Sutton S. (2009) Isotopic evidence for a Martian regolith component in Martian meteorites (abs#1361). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.  
GRIM

Rasool S.I., Hunten D.M. and Kaula W. (1977) What the exploration of Mars tells us about the Earth. *Physics Today* 7-77, 23-32.

Reed G.W. and Jovanovic S. (1969) Some halogen measurements on chondrites. *Earth Planet. Sci. Lett.* 6, 316-320.  
Shergotty

Reedy R.C. (1984a) Cosmogenic radionuclides and exposure histories of SNC meteorites (abs). *Meteoritics* 19, 297-298.

Reedy R.C. (1984b) Calculated production rates of noble gases in the SNC meteorites (abs). *Lunar Planet. Sci.* XV, 677-678. Lunar Planetary Institute, Houston.

Reedy R.C. (1989) Cosmogenic nuclides and the exposure histories of the SNC meteorites (abs). *Intl. Conf. on Mars* 4<sup>th</sup>, LA-UR-88-3242.

Reid A.M. and Bunch T.E. (1975) The nakhlites, part II. Where, when and how? *Meteoritics* 10, 317-324.  
Lafayette Nakhla

Reid A.M. and Score R. (1981) A preliminary report on the achondrite meteorites in the 1979 U. S. Antarctic Meteorite Collection. *Proc. 6th Sym. Antarctic Meteorites. Mem. Natl. Inst. Polar Res. Spec. Iss.* 20, 33-52. Nat. Inst. Polar Res., Tokyo.  
EETA79001

- Reid A.M. (1981) EETA79001 physical and petrographic description. *Antarctic Meteorite Newsletter* 3(3), 4. JSC Curator's Office.  
EETA79001
- Reyes D.P. (1992) Mid-infrared spectra of Martian komatiite. (abs) In *Workshop on the Martian surface and atmosphere through time. LPI Tech. Rpt.* 92-0, 122-123. Lunar Planetary Institute, Houston.
- Reynard B., Beck P., Barret J-A. and Bohn M. (2006) Pyroxene crystal chemistry and the late cooling history of NWA2737 (abs#1963). *Lunar Planet. Sci. Conf. XXXVII* Lunar Planetary Institute, Houston  
NWA2737
- Reynard B., Van de Moortele B., Beck P. and P. Gillet (2006) Shock-induced transformations in olivine of the chassignite NWA2737 (abs#1837). *Lunar Planet. Sci. Conf. XXXVII* Lunar Planetary Institute, Houston  
NWA2737 (Diderot)
- Reynolds V.S., McSween H.Y., McDonough W.F. and McCoy T. (2006) Lithium isotopes in basaltic shergottites: Evidence for a hydrated assimilant (abs#2206). *Lunar Planet. Sci. Conf. XXXVII* Lunar Planetary Institute, Houston
- Rieder R., Economou T., Wänke H., Turkevich A., Crisp J., Bruckner J., Dreibus G. and McSween H.Y. (1997a) The chemical composition of Martian soil and rocks returned by the mobile alpha proton X-ray spectrometer: Preliminary results from the X-ray mode. *Science* 278, 1771-1774.
- Rieder R., Wänke H., Economou T. and Turkevich A. (1997b) *J. Geophys. Res.* 102, 4027-4044.
- Rice J.W. (1997) Searching for the ALH84001 "smoking gun" (parent crater) (abs#1159). *Lunar Planet. Sci. XXVIII* Lunar Planetary Institute, Houston  
ALH84001
- Ridley W.I., Plumlee G.S., DeBraal J.D. and Reed M.H. (1995) Alteration of a Martian surface through time: A reaction path modeling approach (abs). *Meteoritics* 30, 565.
- Ridley W.I. and Plumlee G.S. (1997) On Martian alteration as a function of climate and volcanism (*brief abs*). *Lunar Planet. Sci. XXVIII*, 1165. Lunar Planetary Institute, Houston
- Rieder R., Economou T., Wänke H., Turkevich A., Crisp J., Bruckner J., Dreibus G. and McSween H.Y., Jr. (1997) The chemical composition of Martian Soil and rocks returned by the mobile alpha proton X-ray spectrometer: Preliminary results from the X-ray mode. *Science* 278, 1771-1774.  
Barnacle Bill, Yogi, Wedge, Shark, Half Dome, Zagami
- Rietmeijer F.J.M. (1983) Shock induced chemical reactions in Allan Hills achondrite ALHA77005,21 (abs). *Meteoritics* 18, 387.  
ALHA77005
- Righter K. and Drake M.J. (1996) Core formation in the Earth's Moon, Mars and Vesta. *Icarus* 124, 513-529.
- Righter K. and Drake M.J. (1997) Core formation in Earth and Mars (abs). *7th Goldschmidt Conf.*, LPI Contribution 921, 174. Tucson.
- Righter K., Hervig R.L. and Kring D.A. (1997) Ion microprobe analyses of SNC meteorite melt inclusions (abs). *Lunar Planet. Sci. XXVIII*, 1181-1182. Lunar Planetary Institute, Houston.

Chassigny LEW88516

Righter K., Hervig R.L. and Kring D.A. (1998) Accretion and core formation on Mars: Molybdenum contents of melt inclusion glasses in three SNC meteorites. *Geochim. Cosmochim. Acta* 62, 2167-2177.

LEW88516 Governador Valadares Chassigny

Righter K. and Shearer C.K. (2003) Magmatic fractionation of Hf and W: Constraints on the timing of core formation and differentiation in the Moon and Mars. *Geochim. Cosmochim. Acta* 67, 2497-2507.

Righter K. and Danielson L.R. (2008) Are shergottites sulfide-saturated (abs)? *Meteor. & Planet. Sci.* 43, A131.

Righter K., Yang H., Costin G. and Downs R.T. (2008) Oxygen fugacity in the Martian mantle controlled by carbon: new constraints from the nakhelite MIL 03346. *Meteor. & Planet. Sci.* 43, 1709-1723. MIL03346

Righter K., Pando K.M. and Danielson L. (2009) Solubility of sulfur in Shergottitic silicate melts up to 0.8 GPa: Implications for S contents of Shergottites (abs#1428). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.

Righter M., Lapan T.J., Righter K. and Brandon A. (2008) Partitioning of Hf between chromite and silicate melts: Implications for Lu-Hf isotopic systematics of Martian meteorite ALH84001 (abs). *Meteor. & Planet. Sci.* 43, A132. ALH84001

Righter M., Lapan T.J., Brandon A.D., Beard B.L., Shafer J.T. and Peslier A.H. (2009) Lu-Hf age and isotopic systematics of ALH84001 (abs#2256). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands. ALH84001

Robbins L.L., Van Cleve K. and Ryan J. (1999) Comparison of carbonate textural features in ALH84001 and microbially induced textures in orthopyroxene (abs#1464). *Lunar Planet. Sci.* XXX, Lunar Planetary Institute, Houston (CD-ROM). ALH84001

Rochette P., Lorand J-P., Fillion G. and Sautter V. (2001a) Pyrrhotite and the remanent magnetization of SNC meteorites: a changing perspective on Martian magnetism. *Earth Planet. Sci. Lett.* 190, 1-12.

Rochette P., Lorand J. P., Fillion G., Brunet F. and Sautter V. (2001b) Implications of pyrrhotite being the major magnetic carrier in SNCs (abs). *Meteoritics & Planet. Sci.* 36, A176.

Rochette P., Fillion G., Ballou R., Brunet F., Ouladdiaf B. and Hood L. (2003) High pressure magnetic transition in pyrrhotite and impact demagnetization on Mars. *Geophys. Res. Lett.* 30, 1683, doi:10.1029/2003GL017359

Rochette P., Gattacceca J., Chevrier V., Hoffmann V., Lorand J.P., Funaki M. and Hochleitner R. (2005a) A synthesis on the magnetic properties of Martian meteorites (abs#1614). *Lunar Planet. Sci.* XXXVI Lunar Planetary Institute, Houston. (CD-ROM)

Rochette Pierre, Gattacceca J., Chevrier V., Hoffmann V., Lorand J-P., Funaki M. and Hochleitner R. (2005b) Matching Martian crustal magnetization and magnetic properties of Martian meteorites. *Meteoritics & Planet. Sci.* 40, 529-540.

Romanek C.S., Grady M.M., Wright I.P., Mittlefehldt D.W., Socki R.A., Pillinger C.T. and Gibson E.K.

(1994a) Record of fluid-rock interactions on Mars from the meteorite ALH84001. *Nature* 372, 655-657.

ALH84001

Romanek C.S., Mittlefehldt D.W., Gibson E.K., Jr. and Socki R.A. (1994b) Martian carbonates in ALH84001: Textural, elemental, and stable isotopic compositional evidence on their formation (abs). *Meteoritics* 29, 523.

ALH84001

Romanek C.S., Thomas K.L., Gibson E.K., McKay D.S. and Socki R.A. (1995a) Petrogenesis of carbon and sulfur-bearing minerals in the Martian meteorite ALH84001 (abs). *Lunar Planet. Sci. XXVI*, 1183-1184. Lunar Planetary Institute, Houston.

ALH84001

Romanek C.S., Thomas K.L., Gibson E.K., McKay D.S. and Socki R.A. (1995b) Carbon and sulfur-bearing minerals in the Martian meteorite Allan Hills 84001 (abs). *Meteoritics* 30, 567-568.

ALH84001

Romanek C.S., Perry E.C., Gibson E.K. and Socki R.A. (1996a) Stable isotopic analysis of diatomic oxygen from SNC meteorites (abs). *Lunar Planet. Sci. XXVII*, 1097-1098. Lunar Planetary Institute, Houston

ALH84001 Lafayette Chassigny EETA79001 Zagami

Romanek C.S., Treiman A.H., Jones J.H., Gibson E.K. and Socki R.A. (1996b) Oxygen isotopic evidence for aqueous activity on Mars: Delta  $^{18}\text{O}$  of Lafayette iddingsite (abs). *Lunar Planet. Sci. XXVII* 1099-1100. Lunar Planetary Institute, Houston

Lafayette

Romanek C.S., Gibson E.K., Socki R.A. and Perry E.C. (1996c) Oxygen isotopes in Martian SNC meteorites (abs). In *Workshop on evolution of Martian volatiles*. (eds. Jakosky and Treiman) *LPI Tech. Rpt.* 96-01, 39-40. Lunar Planetary Institute, Houston.

ALH84001

Romanek C.S., Perry E.C., Treiman A.H., Socki R.A., Jones J.H. and Gibson E.K. (1998) Oxygen isotopic record of silicate alteration in the Shergotty-Nakhla-Chassigny meteorite Lafayette. *Meteoritics & Planet. Sci.* 33, 775-784.

Shergotty EET79001 Zagami Lafayette Chassigny

Rost D., Geshake A., Stephan T. and Jessberger E.K. (2000) Time-of-flight secondary ion mass spectrometer analysis of the Los Angeles basaltic shergottite: Prelude to a comprehensive study of all Martian meteorites (abs). *Meteoritics & Planet. Sci.* 35, A138.

Los Angeles

Rost D., Geshake A., Stephan T., Fritz J., Weber I. and Jessberger E.K. (2001) First results from a comprehensive study of melt inclusions in Martian meteorites (abs). *Meteoritics & Planet. Sci.* 36, A177-178.

Rost D., Fritz J., Geshake A., Jesseberger E.K., Stephan T. and Weber I. (2002) Characterization of melt inclusions in Martian meteorites by using TOF-SIMS, EMPA and SEM (abs). *Meteoritics & Planet. Sci.* 37, A122.

Rost D., Fritz J., Geshake A., Jessberger E.K., Stephan T., Stöffler D. and Weber I. (2003) Investigation of a brown weathering product found in Nakhla melt inclusions (abs). *Meteoritics & Planet. Sci.* 38, A127.

Nakhla

Rost D., Vincenzi E.P. and Pauli E.C. (2005a) Halite, sulfate and clay assemblages in the Nakhla Martian meteorite (abs#1499). *Lunar Planet. Sci.* XXXVI Lunar Planetary Institute, Houston. (CD-ROM)  
Nakhla

Rost D. and Vincenzi E.P. (2005b) An SEM-based cathodoluminescence study of mesotaxis: In the naklites Nakhla, Lafayette and MIL03346 (abs). *Meteoritics & Planet. Sci.* 40, A130.  
MIL03346

Rost D., Vicenzi E.P. and Fries M. (2006) A host for lithium in MIL03346 and implications for aqueous alterations on Mars (abs#2362). *Lunar Planet. Sci. Conf.* XXXVII Lunar Planetary Institute, Houston  
MIL03346

Rowe M.W., Bogard D.D. and Kuroda P.K. (1966) Mass yield spectrum of cosmic-ray-produced xenon. *J. Geophys. Res.* 71, 4679-4681.  
Nakhla Lafayette

Rubin A.E. (1997a) Mineralogy of meteorite groups. *Meteoritics & Planet. Sci.* 32, 231-247.

Rubin A.E. (1997b) Mineralogy of meteorite groups: an update. *Meteoritics & Planet. Sci.* 32, 733-734.

Rubin A.E., Warren P.H., Greenwood J.P., Verish R.S., Leshin L.A. and Hervig R.L. (2000a) Petrology of Los Angeles: A new basaltic shergottite find (abs#1963). *Lunar Planet. Sci.* XXXI Lunar Planetary Institute, Houston (CD-ROM).  
Los Angeles

Rubin A.E., Warren P.H., Greenwood J.P., Verish R.S., Leshin L.A., Hervig R.L., Clayton R.N. and Mayeda T.K. (2000b) Los Angeles: The most differentiated basaltic Martian meteorite. *Geology* 28, 1011-1014.  
Los Angeles

Rudnick R.L., Ashwal L.D., Henry D.J., Gibson E.K., Roedder E., Belkin H.E. and Colucci M.T. (1985) Fluid inclusions in stony meteorites - a cautionary note. *Proc. 15th Lunar Planet. Sci. Conf., in J. Geophys. Res.* 90, C669-C675.  
EETA79001

Rumble D. and Irving A.J. (2009) Dispersion of oxygen isotopic compositions among 42 Martian meteorites determined by laser fluorination: Evidence for assimilation of (ancient) altered crust (abs#2293). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.

Russell S.S., Zipfel J., Grossman J.N. and Grady M.M. (2002) The meteoritical bulletin, No. 86, 2002 July. *Meteoritics & Planet. Sci.* 37, A157-A184.  
Dho378 Gro99027 NWA856 NWA1068 NWA1110 SaU060 SaU090

Russell Sara., Zipfel J., Folco Luigi, Jones R., Grady M.M., McCoy T. and Grossman J.N. (2003) The meteoritical bulletin, No. 87, 2003 July. *Meteoritics & Planet. Sci.* 38, A189-A248.  
DaG975 NWA998 NWA1183 NWA1195 NWA1669 NWA1775 SaU120 SaU150 Y980459

Russell S.S., Folco L., Jones R., Grady M.M., Zolensky M.E., Jones R., Righter K., Zipfel J. and Grossman J.N. (2004) The Meteoritical Bulletin, No. 88, 2004 July. *Meteoritics & Planet. Sci.* 39, A215-272.  
DaG1037 NWA1950 NWA2046 SaU130 SaU131 SaU125

Russell S.S., Zolensky M.E., Righter Kevin., Folco L., Jones R., Connolly H.C., Grady M.M. and Grossman J.N. (2005) The Meteoritical Bulletin, No. 89, 2005 September. *Meteoritics & Planet. Sci.* 40, A201-A263.

NWA2373 NWA2626 NWA3171 GRV 020090

Rutherford M.J., Calvin C., Nicholis and McCanta M. (2005) Petrology and melt compositions in Nakhlite MIL03346: Significance of data from natural sample and from experimentally fused groundmass and M.I.'s. (abs#2233). *Lunar Planet. Sci.* XXXVI. Lunar Planetary Institute, Houston. (CD-ROM)  
MIL03346

Rutherford M.J. and Hammer J.E. (2008) Oxidation states in MIL03346 Nakhlite from experiments reproducing phenocryst-melt equilibria as a function of fO<sub>2</sub> and T at 40-150 MPa (abs#1983). *Lunar Planet. Sci.* XXXIX. Lunar Planetary Institute, Houston  
MIL03346

Ruzicka A., Snyder G.A. and Taylor L.A. (2002) Comparative geochemistry of basalts from the Moon, Earth, HED asteroid, and Mars: Implication for the origin of the Moon. *Geochim. Cosmochim. Acta* 65, 979-997.

Ryder G. (1982a) A note against a small-body origin for shergottites, nakhlites and chassignites. *Proc. Lunar Planet. Sci. Conf.* 13th, *J. Geophys. Res.* 87, A401-402.

Sack R.O., Azeredo W.J. and Lipschutz M.E. (1991) Olivine diogenites: The mantle of the eucrite parent body. *Geochim. Cosmochim. Acta* 55, 1111-1120.  
ALHA84001 (NOT)

Salisbury J. and Hunt J. (1975) Visible and near-infrared spectra: X. Stony meteorites. *Modern Geology* 5, 115-126.  
Nakhla

Salisbury J.W., D'Ana D.M. and Jaroswich E. (1991) Mid-infrared (2.5 -13.5 micrometers) reflectance spectra of powdered stony meteorites. *Icarus* 92, 280-297.  
ALHA77005 EETA79001

Sandford S.A. (1984) Infrared Transmission Spectra from 2.5 to 25 microns of various meteorite classes. *Icarus* 60, 115-126.  
Nakhla Lafayette Shergotty

Sanloup C., Jambon A. and Gillet P. (1999) A simple chondrite model for Mars. *Earth Planet. Sci. Lett.* 112, 43-54.

Sanloup C., Blichert-Troft J., Telouk P., Gillet P. and Albarede F. (2000) Evidence for extinct <sup>92</sup>Nb radioactivity in chondrites and SNC meteorites (abs#1247). *Lunar Planet. Sci.* XXXI Lunar Planetary Institute, Houston (CD-ROM).

Sano Y., Terada K., Takeno S., Taylor L.A. and McSween H.Y. (2000) Ion microprobe uranium-thorium-lead dating of Shergotty phosphates. *Meteoritics & Planet. Sci.* 35, 341-346.  
Shergotty

Sarafin R. (1985) *10Be, 26Al, 36Cl und 53Mn in steinmeteoriten und gedanken zum noch ungeklärten Ursprung der Shergottite*. Thesis, Univ. Köln, Köln.

Sarafin R., Herpers U., Signer P., Wieler R., Bonani G., Hofmann H.J., Morenzoni E., Nessi M., Suter M. and Wölfli W. (1985) <sup>10</sup>Be, <sup>26</sup>Al, <sup>53</sup>Mn and light noble gases in the Antarctic shergottite EETA79001(A). *Earth Planet. Sci. Lett.* 75, 72-76.  
EETA79001

- Satake W., Mikouchi T., Makishima J. and Miyamoto M. (2009) Comparison of redox states between geochemically-intermediate and enriched Iherzolitic Shergottites (abs#1717). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.
- Satterwhite C. and Mason B. (1991) Macroscopic and thin section description of LEW88516. In *Antarctic Meteorite Newsletter* 14 (2), 19. JSC Curator's Office, Houston.  
LEW88516
- Sautter V., Barrat J.A., Gillet Ph., Jambon A., Lorand J.P., Jovoy M., Joron J.L. and Lesourd M. (2001) A new Martian meteorite from Morocco the Nakhelite NWA817 (abs). *Meteoritics & Planet. Sci.* 36, A182.  
NWA817
- Sautter V., Barrat J.A., Jambon A., Lorand J.P., Gillet P., Jovoy M., Joron J.L. and Lesourd M. (2002) A new Martian meteorite from Morocco: the Nakhelite North West Africa 817. *Earth Planet. Sci. Letters* 195, 223-238.  
NWA817
- Sautter V., Barrat J.A. and Jambon A. (2002) Is olivine speedometer a reliable tool to constrain thermal story of SNC meteorite? (abs) Un-mixing SNCs. 51. LPI Contribution No. 1134. Lunar Planetary Institute, Houston.
- Sautter V., Jambon A. and Boudouma O. (2005) Cl-amphibole in melt inclusion from MIL03346: Evidence for Martian soil assimilation (abs). *Meteoritics & Planet. Sci.* 40, A134  
MIL03346
- Sautter V., Jambon A. and Boudouma O. (2006) Cl-rich amphibole in MIL03346: Trace of Martian soil in a Martian meteorite (abs#1318). *Lunar Planet. Sci. Conf.* XXXVII Lunar Planetary Institute, Houston.  
MIL03346
- Sautter V., Jambon A. and Boudouma O. (2006) Cl-amphibole in the nakhelite MIL03346: Evidence for sediment contamination in a Martian meteorite. *Earth Planet. Sci. Lett.* 252, 45-55.  
MIL03346
- Sawyer D.J., McGehee, M.D., Canepa J. and Moore C.B. (2000) Water soluble ions in the Nakhla Martian meteorites. *Meteoritics & Planet. Sci.* 35, 743-747.  
Nakhla Lafayette Chassigny Shergotty
- Saxton J.M., Lyon I.C. and Turner G. (1997a) Oxygen isotope ratio zoning in ALH84001 carbonates (abs). In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life.* (eds. Clifford et al.) LPI Contribution 916, 70. Lunar Planetary Institute, Houston.  
ALH84001
- Saxton J.M., Lyon I.C., Chatzitheodoridis E. and Turner G. (1997b) Oxygen isotopic composition of Nakhla carbonate (abs). *Meteoritics & Planet. Sci.* 32, A113-114.  
Nakhla
- Saxton J.M., Lyon I.C. and Turner G. (1997c) Correlated oxygen isotope ratios and chemistry in Allan Hills 84001 carbonates (abs). *Meteoritics & Planet. Sci.* 32, A114-115.  
ALH84001
- Saxton J.M., Lyon I.C. and Turner G. (1998a) Oxygen isotopic composition of Nakhla siderite: Implications for Martian volatiles (abs). *Meteoritics & Planet. Sci.* 33, A172.

Nakhla

Saxton J.M., Lyon I.C. and Turner G. (1998b) Oxygen isotopic composition of Nakhla siderite: Implications for Martian volatiles (abs). *Workshop on the Issue Martian Meteorites: Where - - - #7021*. Lunar Planetary Institute, Houston.

Saxton J.M., Lyon I.C. and Turner G. (1998c) Correlated chemical and isotopic zoning in carbonates in the Martian meteorite ALH84001. *Earth Planet. Sci. Lett.* 160, 811-822.  
ALH84001

Saxton J.M., Lyon I.C. and Turner G. (1999) Oxygen-isotopic composition of Nakhla anhydrite (abs). *Meteoritics & Planet. Sci.* 34, A101-102.  
Nakhla

Saxton J.M., Lyon I.C. and Turner G. (2000) Ion probe studies of deuterium/hydrogen in the Nakhlite meteorites (abs). *Meteoritics & Planet. Sci.* 35, A142-143.  
Nakhla Lafayette

Saxton J.M., Lyon I.C., Chaztitheodoridis E. and Turner G. (2000) Oxygen isotopic composition of carbonate in the Nakhla meteorite: Implications for the hydrosphere and atmosphere of Mars. *Geochim. Cosmochim. Acta* 64, 1299-1309.  
Nakhla

Schaal R.B. and Hörz F. (1977) Shock metamorphism of lunar and terrestrial basalts. *Proc. Lunar Sci. Conf.* 8th, 1697-1729.

Schade U. and Wasch R. (1999) Near-infrared reflectance spectra from bulk samples of two Martain meteorites Zagami and Nakhla. *Meteoritics & Planet. Sci.* 34, 417-424.  
Zagami Nakhla

Schaeffer O.A. and Warasila R. (1981)  $^{39}\text{Ar}$ - $^{40}\text{Ar}$  study of Allan Hills meteorite A77005, A unique achondrite (abs). *Lunar Planet. Sci.* XII, 932-933. Lunar Planetary Institute, Houston  
ALHA77005

Scherer P. and Schultz L. (1999) Noble gases in the SNC meteorite Dar al Gani 476 (abs#1144). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM).  
DaG476

Schnabel C., Ma. P., Herzog G.F., Faestermann T., Knie K. and Korschinek G. (2001)  $^{10}\text{Be}$ ,  $^{26}\text{Al}$  and  $^{53}\text{Mn}$  in Martian meteorites (abs#1353). *Lunar Planet. Sci.* XXXII, Lunar Planetary Institute, Houston.  
(CD-ROM)  
EETA79001 QUE94201 Zagami ALH77005 LEW88516 ALH84001

Schneider D.M., Hartmann W.K., Benoit P.H. and Sears D.W. (2000) Fusion crust simulation and the search for Martian sediments on Earth.(abs#1388). *Lunar Planet. Sci.* XXXI, Lunar Planetary Institute, Houston (CD-ROM).

Schnetzler C.C. and Philpotts J.A. (1969) Genesis of the calcium-rich achondrites in light of rare earth and barium concentrations. In *Meteorite Research* (ed. Millman) 206-216. Springer-Verlag, NY.  
Shergotty

Schmitt R.A. and Smith R.H. (1963) Implications of the similarity in rare earth fractionation of nakhritic meteorites and terrestrial basalts. *Nature* 199, 550-551.  
Lafayette Nakhla

- Schmitt R.A., Goles G.G., Smith R.H. and Osborn T.W. (1972) Elemental abundances in stone meteorites. *Meteoritics* 7, 131-160.  
Lafayette Nakhla Shergotty(?)
- Schlüter J., Schultz L., Thiedig F., Al-Mahdi B.O. and Abu Aghreb A.E. (2002) The Dar al Gani meteorite field (Libyan Sahara): Geologic setting, pairing of meteorites and recovery density. *Meteoritics & Planet. Sci.* 37, 1079-1093.
- Schultz L. (1985) Terrestrial ages of Antarctic meteorites: Implications for concentration mechanisms. In *International Workshop on Antarctic Meteorites*. (ed. Annexstad) *LPI Tech. Rpt.* 86-1, 80-82. Lunar Planetary Institute, Houston.
- Schultz L. (1998) Der meteoritenschatz in der Sahara. *Max-Planck-Gesellschaft* vol. 3, 3-7.
- Schultz L. and Freundel M. (1984) Terrestrial ages of Antarctic meteorites (abs). *Meteoritics* 19, 310.  
ALHA77005
- Schultz L. and Kruse H. (1978) Light noble gases in stony meteorites- a compilation. *Nuc. Track Detection* 2, 65-103.
- Schultz L., Frank L. and Kruse H. (1996) Helium, Neon and Argon in Meteorites: A data compilation. Max-Planck-Inst., Mainz.
- Schultz L. and Sears D. (1997) In the tracks of Martians. *Meteoritics & Planet. Sci.* 32, 3-4. (editorial)  
ALH84001
- Schultz L., Franchi I. A., Reid A. M. and Zolensky M. E. (1999) *Workshop on Extraterrestrial Materials from Cold and Hot Deserts*. LPI Cont. 997. Lunar Planetary Institute, Houston.
- Schutt J., Fessler B. and Cassidy W.A. (1993) Antarctic meteorite location and mapping project, 2nd edition. *LPI Tech. Rpt.* 93-07 Lunar Planetary Institute, Houston.
- Schwandt C.S., Hörr F., Haynes G. and Lofgren G.E. (1998) Shock experiments using Homestake Formation as an analog for the carbonate in Meteorite ALH84001 (abs). *Meteoritical Society, Dublin*.
- Schwandt C.S., McKay G.A. and Lofgren G.E. (1999a) Silica in Martian meteorites, there are differences. (abs#1637). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM).  
Shergotty Zagami ALH84001
- Schwandt C S., McKay G.A. and Lofgren G.E. (1999b) FESEM imaging reveals previously unseen detail and enhances interpretations of ALH84001 carbonate petrogenesis (abs#1346). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001
- Schwandt C.S., Jones J.H., Mittlefehldt D.W. and Treiman A.H. (2001) The magma composition of EET79001A: The first recount (abs#1913). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
EETA79001
- Schwenzer S.P., Mohapatra R.K., Herrmann S. and Ott U. (2002a) Noble gas distribution in the Martian meteorites Sayh al Uhaymir 005 (SaU 005) (abs#1624). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)  
SaU005
- Schwenzer S.P., Mohapatra R.K., Herrmann S. and Ott U. (2002b) Nitrogen and noble gases in mineral

separates from Nakhla (abs). *Meteoritics & Planet. Sci.* 37, A127.  
Nakhla

Schwenzer S.P., Mohapatra R.K., Herrmann S. and Ott U. (2002c) Nitrogen and noble gases in mineral separates from Zagami (abs). Un-mixing SNCs. 53-54. LPI Contribution No. 1134. Lunar Planetary Institute, Houston  
Zagami

Schwenzer S.P., Mohapatra R.K. and Ott U. (2002d) Nitrogen and noble gases in calichi from the Martian meteorite SaU008 (abs). 12<sup>th</sup> Goldschmidt Conf. *Geochim. Cosmochim. Acta* 66, A693. Davos  
SaU008

Schwenzer S.P., Mohapatra R.K., Herrmann S. and Ott U. (2003a) Nitrogen and heavy noble gases in sands that hosted Sayh al Uhaymir 008 in Oman desert (abs#1694). *Lunar Planet. Sci. XXXIV* Lunar Planetary Institute, Houston.  
SaU008

Schwenzer S.P., Mohapatra R.K., Herrmann S. and Ott U. (2003b) Noble gases in maskelynite from the Martian meteorite Shergotty (abs). *Meteoritics & Planet. Sci.* 38, A116.  
Shergotty

Schwenzer S.P., Herrmann S. and Ott. U. (2005) Noble gases in mineral separates from Shergotty and Zagami (abs#1310). *Lunar Planet. Sci. XXXVI* Lunar Planetary Institute, Houston. (CD-ROM)  
Shergotty Zagami

Schwenzer S.P., Huth J., Herrmann S. and Ott U. (2005) Characterizing a model sample for desert weathering influence on noble gases in Martian meteorites (abs#5027). *Meteoritics & Planet. Sci.* 40, A137.

Schwenzer S.P., Hermann S. and Ott U. (2006a) Pyroxenes from Governador Valadares and Lafayette: A nitrogen and noble gas study (abs#1612). *Lunar Planet. Sci. Conf. XXXVII* Lunar Planetary Institute, Houston  
Governador Valadares Lafayette

Schwenzer S.P. and Ott U. (2006b) Evaluating Kr- and Xe-data in the nakhrites and ALH84001 – Does EFA hide EFM? (abs#1614) *Lunar Planet. Sci. Conf. XXXVII* Lunar Planetary Institute, Houston  
Lafayette ALH84001

Schwenzer S.P., Hermann S., Mohapatra Ratan and Ott Ulrich (2007) Noble gases in mineral separates from three shergottites: Shergotty, Zagami and EETA79001. *Meteoritics & Planet. Sci.* 42, 387-412.  
Shergotty Zagami EETA79001

Schwenzer S.P., Colindres M., Billmeier U., Hermann S. and Ott U. (2007) Martian meteorite Nakhla: Noble gases in bulk, mineral separates and etched bulk (abs#5187). *Meteoritics & Planet. Sci.* 42, A139.  
Nakhla

Schwenzer S.P., Fritz J., Stöffler D., Trieloff M., Amini M., Greshake A., Herrmann S., Herwig K., Jochum K.P., Mohapatra R.K., Stoll B. and Ott U. (2008) Helium loss from Martian meteorites mainly induced by shock metamorphism: Evidence from new data and a literature compilation. *Meteoritics & Planet. Sci.* 43, 1841-1859.

Schwenzer S.P., Herrmann S. and Ott U. (2008) Noble gases in two shergottites and a nakhelite from Antarctica: Y000027, Y000097 and Y000593 (abs). *Meteoritics & Planet. Sci.* 43, A140.

Sclar C.B. and Morzenti S.P. (1971) Shock-induced planer deformation structures in olivine from the Chassigny meteorite. *Meteoritics* 6, 310-311.  
Chassigny

Score R. (1997) The thrill of the search: Finding ALH84001. *The Planetary Report* XVII, 5-7.  
ALH84001

Score R. and Reid A.M. (1981) Physical and petrographic description of EETA79001. In *Antarctic Meteorite Newsletter* 4(1), 133. JSC Curator's Office, Houston.  
EETA79001

Score R., King T.V.V., Schwarz C.M., Reid A.M. and Mason B. (1982) Descriptions of stony meteorites. In *Smithson. Contrib. Earth Sci.* 24, 44. Washington, DC.  
EETA79001

Score R. and MacPherson G. (1985) Macroscopic and thin section description of ALH84001. In *Antarctic Meteorite Newsletter* 8 (2), 5. JSC Curator's Office, Houston.  
ALH84001

Score R. and Lindstrom M.M. (1990) Guide to US collection of Antarctic meteorites 1976-1988. In *Antarctic Meteorite Newsletter* 13 (1), 1-135. JSC Curator's Office, Houston.

Score R. and Lindstrom M.M. (1993a) List of special meteorites. In *Antarctic Meteorite Newsletter* 16 (2), 5. JSC Curator's Office, Houston.

Score R. and Lindstrom M.M. (1993b) Mix-up in labeling of ALH84001 and EETA79002 thin sections. In *Antarctic Meteorite Newsletter* 16 (3), 2. JSC Curator's Office, Houston.  
ALH84001

Score R. and Mittlefehldt D.W. (1993) Macroscopic and thin section description of ALH84001. In *Antarctic Meteorite Newsletter* 16 (3), 3. JSC Curator's Office, Houston.  
ALH84001

Score R. and Mason B. (1995) Macroscopic and thin section description of QUE94201. In *Antarctic Meteorite Newsletter* 18 (2), 20. JSC Curator's Office, Houston.  
QUE94201

Scott E.R.D. (1998) Biogenic or abiogenic origin of carbonate-magnetite-sulfide assemblages in Martian meteorite Allan Hills 84001 (abs). *Workshop on the Issue Martian Meteorites: Where - - - #7041*. Lunar Planetary Institute, Houston.  
ALH84001

Scott E.R.D. (1999) Origin of carbonate-magnetite-sulfide assemblages in martian meteorite ALH84001. *J. Geophys. Res.* 104, 3803-3813.  
ALH84001

Scott E.R.D., Yamaguchi A. and Krot A.N. (1997a) Shock melting of carbonate, plagioclase and silica in the Martian meteorite ALH84001 (abs). *Lunar Planet. Sci.* XXVIII, 1271-1272. Lunar Planetary Institute, Houston  
ALH84001

Scott E.R.D., Yamaguchi A. and Krot A.N. (1997b) Petrological evidence for shock melting of carbonates in the Martian meteorite ALH84001 (abs). *Nature* 387, 377-379.  
ALH84001

Scott E.R.D., Krot A.N. and Yamaguchi A. (1997c) Formation of carbonates in Martian meteorite Allan Hills 84001 from shock melts (abs). *Meteoritics & Planet. Sci.* 32, A117-118.  
ALH84001

Scott E.R.D. and Krot A.N. (1998a) Carbonates in Martian meteorite ALH84001: Petrologic evidence for an impact origin (abs#1786). *Lunar Planet. Sci. XXIX* Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Scott E.R.D. and Krot A. N. (1998b) Formation of pre-impact, interstitial carbonates in the ALH84001 Martian meteorite (abs). *Meteoritics & Planet. Sci.* 33, A139-140.  
ALH84001

Scott E.R.D., Krot A.N. and Yamaguchi A. (1998c) Carbonates in fractures of Martian meteorite Allan Hills 84001: Petrologic evidence for impact origin. *Meteoritics & Planet. Sci.* 33, 709-719.  
ALH84001

Scott E.R.D. and Krott A.N. (1998d) Origin of carbonate in Martian meteorite ALH84001 (abs). *Workshop on the Issue Martian Meteorites: Where - - - #7032*. Lunar Planetary Institute, Houston.  
ALH84001

Scott E.R.D., Krot A.N. and Yamaguchi A. (1999) Comment on “Petrologic evidence for low-temperature, possibly flood-evaporitic origin of carbonates in the ALH84001 meteorite” by Paul H. Warren. *J. Geophys. Res.* 104, 24,211-24,215.  
ALH84001

Scott E.R.D. and Barber D.J. (2002a) Origin of magnetite in Martian meteorite Alan Hills 84001 (abs). *Meteoritics & Planet. Sci.* 37, A128.  
ALH84001

Scott E.R.D. and Barber D.J. (2002b) Resolution of a big argument about tiny magnetic minerals in Martian meteorite. In PRS Discoveries. <http://www.psrd.hawaii.edu>

Sears D.W.G. (1999) A review of “Planetary Materials” by Papike *et al. (ed.)*. *Meteoritics & Planet. Sci.* 34, 303-304.

Sears D.W.G. (2000) The exploration of Mars, martian meteorites and the search for life. *Meteoritics & Planet. Sci.* 35, 891-893. (*an editorial*)

Sears D.W.G. and Hasan F.A. (1985) Thermoluminescence and Antarctic meteorites. In *International Workshop on Antarctic Meteorites. (ed. Annexstad)* *LPI Tech. Rpt.* 86-1, 83-100. Lunar Planetary Institute, Houston.  
Shergotty EETA79001

Sears D.W.G. and Kral T.A. (1998a) SEM imaging of Martian and Lunar meteorites and implications for microfossils in Martian meteorites (abs#1934). *Lunar Planet. Sci. XXIX* Lunar Planetary Institute, Houston (CD-ROM).

Sears D.W.G. and Kral T.A. (1998b) Martian “microfossils” in lunar meteorites? *Meteoritics & Planet. Sci.* 33, 791-794.  
ALH84001

Sefton-Nash E., Anand M., Dobson D., Vocadlo L. and Williams T. (2006) The oxygen balance of primordial Mars: Oxygen fugacity of selected SNC meteorites. Sub-surface H<sub>2</sub>O inventory, the Martian Fe+2/Fe+3 ratio & implications for biogenic influences (abs#1748). *Lunar Planet. Sci. Conf.*

XXXVII Lunar Planetary Institute, Houston.

Seitz H-M., Brey G.P., Weyer S., Durali S., Ott U. and Munker C. (2005) Lithium isotopic compositions of Martian and Lunar reservoirs (abs#5102). *Meteoritics & Planet. Sci.* 40, A138.

Seitz H-M., Brey G.P., Weyer S., Durali S., Ott U., Munker C. and Mezger K. (2006) Lithium isotopic compositions of Martian and Lunar reservoirs. *Earth Planet. Sci. Lett.* 245, 6-18.  
Shergotty Zagami EETA79001 ALHA77005 Lafayette Nakhla ALH84001

Sen Gupta P.R. (1995) Petrographic shock features of the Shergotty meteorite (abs). *Lunar Planet. Sci.* XVI, Suppl. A, 21-22. Lunar Planetary Institute, Houston.  
Shergotty

Sephton M.A. and Gilmour I. (1998) A “unique” distribution of polycyclic hydrocarbons in Allan Hills 84001, or a selective attack in meteorites from Mars? (abs) *Meteoritics & Planet. Sci.* 33, A142-143.  
ALH84001

Sephton M.A., Gilmour I., Wright I.P., DeLeeuw J.W., Grady M.M., Pillinger C.T. (2000) High molecular weight organic matter in Nakhla (abs#1786). *Lunar Planet. Sci.* XXXI Lunar Planetary Institute, Houston (CD-ROM).  
Nakhla

Shafer J.T., Brandon A.D., Lapen T.J., Righter M., Beard B. and Peslier A.H. (2009) Lu-Hf age of Martian meteorites Larkman Nunatak 06319 (abs#1803). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.  
LAR06319

Shankar N., Swisher C.C., Turin B. and Herzog G.F. (2008) Ar/Ar – CO<sub>2</sub> laser incremental heating release spectra for the Pasamonte eucrite and Martain meteorites ALH77005, Shergotty and Y000749 (abs#1924). *Lunar Planet. Sci.* XXXIX Lunar Planetary Institute, Houston (CD-ROM).  
ALH77005 Shergotty Y0000749

Sharma M., Papanastassiou D.A., Wasserburg G.J. and Dymek R.F. (1994) The problem of high precision measurements of <sup>142</sup>Nd/<sup>144</sup>Nd: The terrestrial record of <sup>146</sup>Sm (abs). *Lunar Planet. Sci.* XXV, 1253-1254. Lunar Planetary Institute, Houston

Sharp T.G., El Goresy A., Dubrovinsky L. and Chen M. (1998) Microstructures of shocked silicon dioxide in Shergotty: Evidence for multiple post-stishovite silicon dioxide polymorphs and extreme shock pressures (abs). *Meteoritics & Planet. Sci.* 33, A144.  
Shergotty

Sharp T.G., El Goresy A., Dubrovinsky L. and Chen M. (1999a) Very-dense silica minerals in the Shergotty SNC meteorite: Evidence for extreme shock pressures (abs#1827). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM)  
Shergotty

Sharp T.G., El Goresy A., Wopenka B. and Chen M. (1999b) A post-stishovite SiO<sub>2</sub> polymorph in the meteorite Shergotty: implications for impact events. *Science* 284, 1511-1514.  
Shergotty

Shaw J., Hill M.J. and Openshaw S.J. (2001) Investigating the ancient Martian magnetic field using microwaves. *Earth Planet. Sci. Lett.* 190, 103-109.  
Nakhla

Shearer C.K. (1997) Sulfur isotopic systematics in ALH84001: Open- and closed-system behavior of

sulfur in a Martian hydrothermal system (abs). *Lunar Planet. Sci.* XXVIII, 1289-1290. Lunar Planetary Institute, Houston  
ALH84001

Shearer C.K. and Brearley A.J. (1992) Trace element zoning and subsolidus microstructure of pigeonite in the Zagami shergottite (abs). *Lunar Planet. Sci.* XXIII, 1275-1276. Lunar Planetary Institute, Houston  
Zagami

Shearer C.K. and Papike J.J. (1992) Origin of olivine diogenites and their relationship to basaltic magmatism on the eucrite parent body (abs). *Lunar Planet. Sci.* XXIII, 1279-1280. Lunar Planetary Institute, Houston  
ALH84001

Shearer C.K., Spilde M.N., Papike J.J. and Layne G.D. (1996a) Hydrothermal systems on Mars. Insights from sulfur isotopic systematics in alteration assemblages in Martian meteorite ALH84001 (abs). *Lunar Planet. Sci.* XXVII, 1183-1184. Lunar Planetary Institute, Houston  
ALH84001

Shearer C.K., Layne G.D., Papike J.J. and Spilde M.N. (1996b) Sulfur isotopic systematics in alteration assemblages in Martian meteorite ALH84001. *Geochim. Cosmochim. Acta* 60, 2921-2926.  
ALH84001

Shearer C.K. and Papike J.J. (1996) Evaluating the evidence for past life on Mars. *Science* 274, 2121.  
ALH84001

Shearer C.K., Spilde M.N., Wiedenbeck M. and Papike J.J. (1997) The petrogenic relationship between carbonates and pyrite in Martian meteorite ALH84001 (abs). *Lunar Planet. Sci.* XXVIII, 1293-1294. Lunar Planetary Institute, Houston  
ALH84001

Shearer C.K. and Adcock C.T. (1998a) The relationship between the carbonate and shock-produced glass in ALH84001 (abs#1280). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Shearer C.K. and Adcock C.T. (1998b) The composition and distribution of feldspathic shock glass in ALH84001 (abs#1754). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Shearer C.K. and Adcock C.T. (1998c) The origin of olivine in Martian meteorite ALH84001. The distribution of olivine (abs#1281). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Shearer C.K. and Leshin L.A. (1998d) The origin of olivine in Martian meteorite ALH84001. The oxygen isotopic systematics of the olivine (abs#1286). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Shearer C.K. and Adcock C. (1998e) A comparison between sulfide assemblages in Martian meteorites ALH84001 and Governador Valadares (abs). *Workshop on the Issue Martian Meteorites: Where - - - #7031.* Lunar Planetary Institute, Houston.  
ALH84001 Governador Valadares

Shearer C.K. and Brearley A. (1998f) Evidence for a late-stage thermal overprint in ALH84001 and

implications for biomarkers (abs). *Workshop on the Issue Martian Meteorites: Where - - - #7024*.  
Lunar Planetary Institute, Houston.  
ALH84001

Shearer C.K., Leshin L.A. and Adcock C.T. (1999) Olivine in Martian meteorite Allan Hills 84001:  
Evidence for a high-temperature origin and implications for signs of life. *Meteoritics & Planet. Sci.*  
34, 331-339.  
ALH84001

Shearer C.K., Taylor L.A., Nazarov M.A. (2001) Trace element crystal chemistry of minerals in Dhofar  
019. Implications for the petrogenesis of Martian magmas (abs#1881). *Lunar Planet. Sci. XXXII*  
Lunar Planetary Institute, Houston. (CD-ROM)  
Dho019

Shearer C.K., Borg L.E., Papike J.J., Chaklader J., Symes S.J., Irving A.J. and Herd C.D.K. (2005) Do  
early liquidus phases in olivine-phyric Martian basalts reflect the characteristics of their mantle  
sources? Insights from NWA1110, NWA1195 and NWA2046 (abs#1193). *Lunar Planet. Sci. XXXVI*,  
Lunar Planetary Institute, Houston. (CD-ROM)  
NWA1110 NWA1195 NWA2046

Shearer C.K., McKay G.A., Papike J.J. and Karner J. (2006a) Oxygen fugacity of the upper mantle of  
Mars. Evidence from the partitioning behavior of Vanadium in Y980459 and other olivine-phyric  
shergotties (abs#1295). *Lunar Planet. Sci. Conf. XXXVII* Lunar Planetary Institute, Houston. (CD-  
ROM)  
Y980459

Shearer C.K., McKay G.A., Papike J.J. and Karner J. (2006b) Valence state portioning of vanadium  
between olivine-liquid: Estimates of the oxygen fugacity of Y980459 and application to other olivine-  
phyric martian basalts. *Amer. Mineral.* 91, 1657-1663.  
Y980459 SaU005 DaG476 NWA1110

Shearer C.K., Burger P.V., Papike J.J., Borg L.E., Irving A.J. and Herd C. (2008) Petrogenic linkages  
among Martina basalts: Implications based on trace element chemistry of olivine. *Meteorit. & Planet.  
Sci.* 43, 1241-1258.  
RBT04261 NWA2046 NWA2626

Shearer C.K., Burger P.V., Papike J.J. and Karner J. (2009) Comparison between RBT04262 and  
Iherzolitic Shergottites (ALHA77005 and LEW88516) (abs#1300). *Lunar Planet. Sci. XL*, Lunar  
Planetary Institute, The Woodlands.  
RBT04262

Shih C.-Y., Nyquist L.E., Bansal B.M., Wiesmann H., Wooden J.L. and McKay G.A. (1981) REE, Sr and  
Nd isotopic studies on shocked achondrites - Shergottty, Zagami and ALHA77005 (abs). *Lunar Planet.  
Sci.* XII, 973-975. Lunar Planetary Institute, Houston. (CD-ROM)  
Shergotty Zagami ALHA77005

Shih C.-Y., Nyquist L.E., Bogard D.D., McKay G.A., Wooden J.L., Bansal B.M. and Wiesmann H. (1982)  
Chronology and petrogenesis of young achondrites, Shergotty, Zagami, and ALHA77005: Late  
magmatism on a geologically active planet. *Geochim. Cosmochim. Acta* 46, 2323-2344.  
Shergotty Zagami ALHA77005

Shih C.-Y., Nyquist L.E. and Wiesmann H. (1996) Sm-Nd systematics of nakhlite Governador Valadares  
(abs). *Lunar Planet. Sci. XXVII*, 1197-1198. Lunar Planetary Institute, Houston. (CD-ROM)  
Governador Valadares Nakhla

Shih C.-Y., Nyquist L.E., Reese Y. and Wiesmann H. (1998) The chronology of the nakhlite, Lafayette: Rb-Sr and Sm-Nd isotopic ages (abs#1145). *Lunar Planet. Sci.* XXIX, Lunar Planetary Institute, Houston (CD-ROM).

Lafayette

Shih C.-Y., Nyquist L.E. and Wiesmann H. (1999) Samarium-neodymium and rubidium-strontium systematics of nakhlite Governador Valadares. *Meteoritics & Planet. Sci.* 34, 647-655.

Governador Valadares

Shih C.-Y., Wiesmann H., Nyquist L.E. and Misawa K. (2002) Crystallization age of Antarctic nakhlite Y000593: Further evidence of nakhlite launch pairing (abs). *Antarctic Meteorites* XXVII, 151-153, Nat. Inst. Polar Res., Tokyo.

Y000593

Shih C.-Y., Nyquist L.E., Wiesmann H. and Barret J.A. (2003a) Age and petrogenesis of picritic shergottite NWA 1068: Sm-Nd and Rb-Sr isotopic studies (abs#1439). *Lunar Planet. Sci.* XXXIV. Lunar Planetary Institute, Houston.

NWA1068

Shih C.-Y., Nyquist L.E. and Wiesmann H. (2003b) Isotopic studies of Antarctic olivine-phyric shergottite Y980459 (abs). International Symposium. *Evolution of Solar System: A New Perspective from Antarctic Meteorites*, 125-126. Nat. Inst. Polar Res., Tokyo.

Y980459

Shih C.-Y., Nyquist L.E., Wiesmann H. and Misawa K. (2004) Rb-Sr and Sm-Nd isotopic studies of shergottite Y980459 and a petrogenetic link between depleted shergottites and nakhlites (abs#1814). *Lunar Planet. Sci.* XXVII (CD-ROM) Lunar Planetary Institute, Houston.

Y980459

Shih C.-Y., Nyquist L.E., Wiesmann H., Reese Y. and Misawa K. (2005) Rb-Sr and Sm-Nd dating of olivine-phyric shergottite Y980459: Petrogenesis of depleted shergottites. *Antarctic Meteorite Research* 18, 46-65. Nat. Inst. Polar Res., Tokyo.

Y980459

Shih C-Y., Nyquist L.E. and Reese Y. (2006) Rb-Sr and Sm-Nd isotopic studies of Antarctic nakhlite MIL03346 (abs#1701). *Lunar Planet. Sci. Conf.* XXXVII Lunar Planetary Institute, Houston.

MIL03346

Shih C-Y., Nyquist L.E. and Reese Y. (2007) Rb-Sr and Sm-Nd isotopic studies of Martian depleted shergottites SaU094/005 (abs#1745). *Lunar Planet. Sci.* XXXVIII Lunar Planetary Institute, Houston.

SaU094 SaU005

Shih C.-Y., Nyquist L.A. and Reese Y. (2009) Rb-Sr and Sm-Nd studies of olivine-pyric Shergottites RBT04262 and LAR06319: Isotopic evidence for relationship to enriched basaltic Shergottites (abs#1360). *Lunar Planet. Sci.* XL, Lunar Planetary Institute, The Woodlands.

RBT04262 LAR06319

Shimizu H. and Masuda A. (1981) REE, Ba, Sr and Rb abundances in some unique Antarctic achondrites. *Proc. 6th Sym. Antarctic Meteorites. Mem. Natl. Inst. Polar Res. Spec. Iss.* 20, 211-220. Nat. Inst. Polar Res., Tokyo.

ALHA77005

Shirai N., Oura Y. and Ebihara M. (2002) Chemical composition of newly collected Antarctic nakhlites, Y000593 and Y000749 (abs). Un-mixing SNCs. 55-56. LPI Contribution No. 1134. Lunar Planetary

Institute, Houston  
Y000593

Shirai N. and Ebihara M. (2003) Chemical composition of Yamato 980459 (abs). International Symposium. *Evolution of Solar System: A New Perspective from Antarctic Meteorites*, 127-128. Nat. Inst. Polar Res., Tokyo.  
Y980459

Shirai N. and Ebihara M. (2004a) Chemical characteristics of an olivine-phyric shergottite, Yamato 980459 (abs#1511). *Lunar Planet. Sci. XXXV* (CD-ROM) Lunar Planetary Institute, Houston  
Y980459

Shirai N. and Ebihara M. (2004b) Chemical characteristics of a Martian meteorite, Yamato 980459. *Antarctic Meteorite Research* 17, 55-67. Nat. Inst. Polar Res., Tokyo.  
Y980459

Shirai N. and Ebihara M. (2005) Chemical characteristics of nakhelite, MIL 03346 (abs#5245). *Meteoritics & Planet. Sci.* 40, A140.  
MIL03346

Shirai N. and Ebihara M. (2006) The magnetization of Mars inferred from chemical compositions of shergottites (abs#1917). *Lunar Planet. Sci. Conf. XXXVII* Lunar Planetary Institute, Houston

Shirai N. and Ebihara M. (2006) The petrogenesis of nakhlites inferred from chemical compositions of nakhlites (abs). *Antarctic Meteorites* XXX, 59-60. Nat. Inst. Polar Res., Tokyo.  
Y000593 Nakhla MIL03346

Shirai N. and Ebihara M. (2007) Chemical compostion of lherzolitic shergottites Yamato 00097 (abs). *Antarctic Meteorites* XXXI, 91-92. Nat. Inst. Polar Res., Tokyo.  
Y00097

Shirai N. and Ebihara M. (2008) Constraints on the magmatism of Mars inferred from the chemical compositions and radiogenic isotope compositions of shergottites (abs). *Meteoritics & Planet. Sci.* 43, A144.  
NWA856 Y000097 NWA1068

Shirai N. and Ebihara M. (2008) Chemical cahracteristics of nakhlites: Implications to the geological setting for nakhlites (abs#1643). *Lunar Planet. Sci. XXXIX* Lunar Planetary Institute, Houston  
MIL03346

Shukolyukov Yu.A., Nazarov M.A. and Schultz L. (2000) Dhofar 019: A shergottite with an approximately 20 million-year exposure age (abs). *Meteoritics & Planet. Sci.* 35, A147.  
Dho019

Shukolyukov Yu.A., Nazarov M.A. and Schultz L. (2002) A new Martian meteorite: the Dhofar 019 shergottite with an exposure age of 20 million years. *Solar System Research* 36, issue 2, 125-135.  
Kluwer  
Dho019

Silberrad C.A. (1932) Place of fall, Shergahti. *Min. Mag.* 23, 294.  
Shergotty

Simon S.B., Papike J J. and Beauchamp R.H. (1985) Petrography and silicate mineral chemistry of the Shergotty meteorite (abs). *Lunar Planet. Sci. XVI*, Suppl. A, 23-24. Lunar Planetary Institute,

Houston.  
Shergotty

Simonds C.H., Warner J.L., Phinney W.C. and McGee P.E. (1976) Thermal model for impact breccia lithification: Manicouagan and the moon. *Proc. Lunar Sci. Conf.* 7th, 2509-2528.

Singer A.V. and Melosh H.J. (1981) The origin of SNC meteorites: An alternative to Mars (abs). *EOS Trans. AGU* 62, 941.

Singer A.V. and Melosh H.J. (1982) Possible asteroidal origin of SNC meteorites (abs). *Lunar Planet. Sci.* XIII, 472-473. Lunar Planetary Institute, Houston

Singer R.B. and McSween H.Y. (1992) Compositon of the Martian crust: Evidence from spectroscopy and SNC meteorites (abs). *Lunar Planet. Sci.* XXIII, 1303-1304. Lunar Planetary Institute, Houston

Singer R.B. and McSween H.Y. (1993) The igneous crust of Mars: Compositional evidence from remote sensing and the SNC meteorites. In *Resources of Near-Earth Space*. (eds. Lewis, Matthews and Guerrieri) 709-736. Univ. of Arizona Press, Tucson.

Sinha N. and Goswami J. N. (1994) Nuclear track studies of the SNC meteorite ALH84001 (abs). *Meteoritics* 29, 534.  
ALH84001

Sippel R.F. (1971) Luminescence petrography of the Apollo 12 rocks and comparative features in terrestrial rocks and meteorites. *Proc. Lunar Sci. Conf.* 2nd, 247-263.  
Shergotty

Slater V.P. and McSween H.Y. (2002) What do oxygen isotopes in basaltic shergottites record? (abs) *Meteoritics & Planet. Sci.* 37, A133.

Smith C.L., DeLaeter J.R. and Rosman K.J.R. (1977) Mass spectrometric isotope dilution analysis of tellurium in meteorites and standard rocks. *Goechim. Cosmochim. Acta* 41, 676-681.  
Nakhla

Smith J.V. and Hervig R.L. (1978) Shergotty meteorite: Mineralogy, petrography, and minor elements (abs). *Meteoritics* 13, 635-636.  
Shergotty

Smith J.V. and Hervig R.L. (1979) Shergotty meteorite: Mineralogy, petrography, and minor elements. *Meteoritics* 14, 121-142.  
Shergotty

Smith J.V. and Steele I. M. (1982) Petrography and mineralogy of two basalts and olivine-pyroxene-spinel fragments in achondrite EETA79001 (abs). *Meteoritics* 17, 281.  
EETA79001

Smith J.V. and Steele I. M. (1983) Pre-terrestrial alteration of achondrite ALHA77005: Effect of Martian volatiles? (abs) *Lunar Planet. Sci.* XIV, 712-713. Lunar Planetary Institute, Houston  
ALHA77005

Smith J.V., Steele I.M. and Leitch C.A. (1983) Mineral chemistry of the shergottites, nakhlites, Chassigny, Brachina, pallasites and ureilites. *Proc. Lunar Sci. Conf.* 14th; *J. Geophys. Res.* 88 (suppl.), B229-B236.  
Shergotty Zagami Nakhla Lafayette Governador Valadares Chassigny

- Smith J.V. and Steele I. M. (1984) Achondrite ALHA77005: Alteration of chromite and olivine. *Meteoritics* 19, 121-133.  
ALHA77005
- Smith M.R. and Schmitt R.A. (1983) Petrogenesis of shergottites (abs). *Lunar Planet. Sci.* XIV, 717-718. Lunar Planetary Institute, Houston
- Smith M.R., Laul J. C., Ma M.-S., Huston T., Verkouteren R.M., Lipschutz M.E. and Schmitt R.A. (1984) Petrogenesis of the SNC (shergottites, nakhrites, chassignites) meteorites: Implications for their origin from a large, dynamic planet, possibly Mars. *Proc. Lunar Planet. Sci. Conf.* 14th; *J. Geophys. Res.* 89 (suppl.), B612-B630.  
EETA79001 ALHA77005 Shergotty Zagami
- Smith M.R. and Laul J.C. (1985) Rare earth abundances in EETA79001 phosphates (abs). *Meteoritics* 20, 760-761.  
EETA79001
- Socki R.A., Romanek C.S. and Gibson E.K. (1993) D/H exchange reaction in salts extracted from LEW85320 (abs). *Meteoritics* 28, 440.
- Socki R.A., Gibson E.K. and Romanek C.S. (1995) Stable isotope enrichment of carbonate from the Martian meteorite Allan Hills 84001: Test of a hypothesis at Wright Valley, Antarctica. (abs). *Meteoritics* 30, 580-581.  
ALH84001
- Sohl F. and Spohn T. (1997) The interior structure of Mars: implications from SNC meteorites. *J. Geophys.* 102, 1613-1635.
- Solberg T.C. and Burns R.G. (1987) Iron oxidation state and weathering studies of SNC and other Antarctic meteorites (abs). *Lunar Planet. Sci.* XVIII, 936-937. Lunar Planetary Institute, Houston  
EETA79001 ALHA77005 Nakhla
- Solberg T.C. and Burns R.G. (1989) Iron Mössbauer spectral study of weathered Antarctic and SNC meteorites. *Proc. Lunar Planet. Sci. Conf.* 19th, 313-322. Lunar Planetary Institute, Houston.  
EETA79001
- Spencer L.M., McKay D.S., Gibson E.K., Thomas K.L., Wentworth S.J. and Clemett (2008) Observation and analysis of martian meteorite Y000593: Evidence of biosignatures (abs). *Meteor. & Planet. Sci.* 43, A145.
- Spencer L.M., McKay D.S., Gibson E.K., Thomas K.L. and Wentworth S.J. (2008) Observation and analysis of Martian meteorite Y000593: Evidence for biosignatures (abs#1680). *Lunar Planet. Sci.* XXXIX Lunar Planetary Institute, Houston.  
Y000593
- Spivak-Birndorf L.J., Wadhwa M., and Williams L.B. (2008) The boron isotopic composition of Nakhla iddingsite (abs#1904). *Lunar Planet. Sci.* XXXIX Lunar Planetary Institute, Houston  
Nakhla
- Squyres S.W. and Kasting J.F. (1994) Early Mars: How warm and how wet? *Science* 265, 744.
- Straut M.M. and Consolmagno G.J. (2003) Porosity of basaltic materials: Terrestrial and meteoritic samples (abs). *Meteoritics & Planet. Sci.* 38, A106.
- Stauffer H. (1962) On the production rates of rare gas isotopes in stone meteorites. *J. Geophys. Res.* 67,

2023-2028.

Nakhla

Steele I.M. and Smith J.V. (1982a) Mineralogy of Elephant Moraine A79001 two-component achondrite with resemblances to Shergotty (abs). *Lunar Planet. Sci.* XIII, 764-765. Lunar Planetary Institute, Houston.

EETA79001 Shergotty

Steele I.M. and Smith J.V. (1982b) Petrography and mineralogy of two basalts and olivine-pyroxene-spinel fragments in achondrite EETA79001. *Proc. Lunar Planet. Sci. Conf.* 13th; *J. Geophys. Res.* 87, A375-384.

EETA79001

Steele A., Goddard D.T., Grimes G.W., Stapleton D., Smith J., Tapper R., Grady M.M., McKay D.S., Gibson E.K., Thomas-Keprta K.L. and Beech I.B. (1997a) Scanning proton microprobe analysis of fragments of ALH84001 (abs). *Lunar Planet. Sci.* XXVIII, 1367-1368. Lunar Planetary Institute, Houston

ALH84001

Steele A., Goddard D.T., Stapleton D., Smith J., Tapper R., Grady M.M., McKay D.S., Gibson E. K., Thomas-Keprta K.L. and Beech I.B. (1997b) Atomic force microscopy imaging of ALH84001 fragments (abs). *Lunar Planet. Sci.* XXVIII, 1369-1370. Lunar Planetary Institute, Houston

ALH84001

Steele A., Goddard D.T., Toporski J.K.W., Stapleton D., Wynn-Williams D.D. and McKay D.S. (1998a) Terrestrial contamination of an Antarctic chondrite (abs). *Meteoritics & Planet. Sci.* 33, A149.

Steele A., Goddard D.T., Beech I.B., Tapper R.C., Stapleton D. and Smith J.R. (1998b) Atomic force microscopy imaging of fragments of Martian meteorite ALH84001. *J. Microscopy* 189, 2-7.

Steele A., Goddard D.T., Stapleton D., Toporski J. K. W., Sharples G., Wynn-Williams D.D. and McKay D.S. (1999a) Imaging of an unknown organism on ALH84001 (abs). *Lunar Planet. Sci.* XXX, #1326, Lunar Planetary Institute, Houston (CD-ROM).

ALH84001

Steele A., Westall F., Goddard D.T., Stapleton D., Toporski J.K.W., Sharples G. and McKay D.S. (1999b) Imaging of the biological contamination of meteorites: A practical assessment (abs#1321). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM)

ALH84001 Nakhla

Steele A., Toporski J. K. W., Wesall F. W., Thomas-Keprta K., Gibson E. K., Avci R., Whitby C., Griffin C. and McKay D. S. (2000a) The microbiological contamination of meteorites: a Null Hypothesis (abs#1670). *Lunar Planet. Sci.* XXXI Lunar Planetary Institute, Houston (CD-ROM).

Steele A., Goddard D.T., Stapleton D., Toporski J.K.W., Peters V., Bassinger V., Sharples G., Wynn-Williams D.D. and McKay D S. (2000b) Investigations into an unknown organism on the Martian meteorites Allan Hills H4001. *Meteoritics & Planet. Sci.* 35, 237-241.

ALH84001

Steele A., Toporski J.K.W. and McKay D.S. (2001) The terrestrial contamination of meteorites. An update (abs). *Meteoritics & Planet. Sci.* 36, A197.

Nakhla ALH84001

Steele A., Amundsen H.E.F., Fries M.D., Vicenzi E.P., Benning L., Maule J., Mysen B.O., Toporski J., Schweizer M. and Fogel M.L. (2005) A morphological and chemical study of carbonate globules

contained within mantle xenoliths of the Sverrefjell volcano Spitzbergen – Implications for ALH 84001 (abs #2173). *Lunar Planet. Sci.* XXXVI Lunar Planet. Institute, Houston (CD-ROM)  
ALH84001

Steele A., Fries M.D., Amundsen H.E.F., Mysen B.O., Fogel M.L., Schweizer M. and Boctor N.Z. (2007) Comprehensive imaging and Raman spectroscopy of carbonate globules from Martain meteorite ALH 84001 and a terrestrial analogue from Svalbard. *Meteoritics & Planet. Sci.* 42, 1549-1566.  
ALH84001

Steele A., Fries M.D., Amundsen H.E.F., Mysen B.O., Fogel M.L., Schweizer M., Kater and Boctor N.Z. (2008) An abiotic organic synthesis mechanism on Mars (abs#2542). *Lunar Planet. Sci.* XXXIX. Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Stephan T., Rost D., Jessberger E.K. and Greshake A. (1998a) Polycyclic aromatic hydrocarbons in ALH84001 analyzed with time-of-flight secondary ion mass spectrometry (abs#1263). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Stephan T., Rost D., Jessberger E.K. and Greshake A. (1998b) Polycyclic aromatic hydrocarbons are everywhere in Allan Hills 84001 (abs). *Meteoritics & Planet. Sci.* 33, A149-150.  
ALH84001

Stephan T., Rost D., Heiss C.H., Jessberger E.K. and Greshke A. (1998c) The lateral distribution of polycyclic aromatic hydrocarbons in Allan Hills 84001 – Implications for their origin. (abs) *Workshop on the Issue Martian Meteorites: Where - - - #7017*. Lunar Planetary Institute, Houston.  
ALH84001

Stephan T., Heiss C.H., Rost D. and Jessberger E.K. (1999) Polycyclic aromatic hydrocarbons in meteorites: Allan Hills 84001, Murchison and Orgueil (abs#1569). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Stephan T. and Jessberger E.K. (2000a) Polycyclic aromatic hydrocarbons in Allan Hills 84001 – Implications from time-of-flight secondary ion mass spectrometry analyses (abs#1326). *Lunar Planet. Sci.* XXXI Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Stephan T. and Jessberger E.K. (2000b) Polycyclic aromatic hydrocarbons in Allan Hills 84001: A result of terrestrial contamination? (abs) *Meteoritics & Planet. Sci.* 35, A152.  
ALH84001

Stephan T., Jessberger E.K., Heiss C.H. and Rost D. (2003) TOF – SIMS analysis of polycyclic aromatic hydrocarbons in Allan Hills 84001. *Meteoritics & Planet. Sci.* 38, 109-116..  
ALH84001

Stockstill K.R., Bodnar R.J. and McSween H.Y. (2001a) Melt inclusions in Nakhla as monitors of parental melts on Mars (abs#1788). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
Nakhla

Stockstill K.R., Bodnar R J., McSween H.Y. and Benedix G. K. (2001b) Melt inclusions in Nakhla and ALH77005: Indicators of parental magmas on Mars (abs). *Meteoritics & Planet. Sci.* 36, A198.  
Nakhla ALH77005

Stockstill K.R., Bodnar R. J., McSween H.Y., Jr. and Benedix G. K. (2001c) Melt inclusions in Nakhla as monitors of parantal melts on Mars (abs). *Eleventh Goldschmidt Conf.* 3672. Hot Springs.  
Nakhla

Stockstill K.R., Bodnar R.J., McSween H.Y. and Lentz R.C.F. (2002) Melt inclusions in SNC meteorites as indicators of parental melts on Mars (abs#1644). *Lunar Planet. Sci. XXXIII* Lunar Planetary Institute, Houston. (CD-ROM)  
Nakhla

Stöffler D. (1974) Deformation and transformation of rock-forming minerals by natural and experimental shock processes: II Physical properties of shocked minerals. *Fortschr. Mineral.* 51, 256-289.

Stöffler D. (2000) Maskelynite confirmed as diaplectic glass: Indication for peak shock pressures below 45 GPA in all Martian meteorites (abs#1170). *Lunar Planet. Sci. XXXI* Lunar Planetary Institute, Houston (CD-ROM).

Stöffler D. and Ostertag R. (1985) Shock history of the shergottites (abs). *Meteoritics* 20, 764-765.  
Shergotty Zagami EETA79001 ALHA77005.

Stöffler D., Ostertag R., Jammes C., Pfannschmidt G., Sen Gupta P.R., Simon S.B., Papike J.J. and Beauchamp R.H. (1986) Shock metamorphism and petrography of the Shergotty achondrite. *Geochim. Cosmochim. Acta* 50, 889-913.  
Shergotty

Stolper E. M. (1979) *Igneous petrology of differentiated meteorites*. PhD Thesis, Harvard University, Cambridge.  
Shergotty Zagami

Stolper E. M. (1980) Trace elements in shergottite meteorites: Implications for the origins of planets. *Earth Planet. Sci. Lett.* 42, 239-242.  
Shergotty Zagami

Stolper E.M., Hays J.F. and McSween H.Y. (1978) A petrogenetic model relating basaltic achondrites, the shergottites, the nakhlites and the chassignites (abs). *Meteoritics* 13, 640-641.

Stolper E.M., McSween H.Y. and Hays J.F. (1979) A petrogenetic model of the relationships among achondritic meteorites. *Geochim. Cosmochim. Acta* 43, 589-602.  
Shergotty Zagami Nakhla Chassigny

Stolper E.M. and McSween H.Y. (1979) Petrology and origin of the shergottite meteorites. *Geochim. Cosmochim. Acta* 43, 1475-1498.  
Shergotty Zagami

Stopar J.D., Lawrence S.J., Lentz R.C.F. and Taylor G.J. (2005) Preliminary analysis of nakhlite MIL03346, with a focus on secondary alteration (abs#1547). *Lunar Planet. Sci. XXXVI* Lunar Planetary Institute, Houston. (CD-ROM)  
MIL03346

Stopar J.D. and Taylor G.J. (2006) Martian and lunar meteorites: Styles of aqueous alteration (abs#1652). *Lunar Planet. Sci.* XXXVII Lunar Planetary Institute, Houston (CD-ROM)

Stopar J.D., Tayler G.J. and Norman M.D. (2007) Major and trace elements in nakhlite MIL03346 with a focus on aqueous alteration products (abs#1448). *Lunar Planet. Sci. XXXVIII* Lunar Planetary Institute, Houston (CD-ROM)  
MIL03346

Space Science Board (see Wood *et al.* 2003) especially appendix B therein

Sugiura N. and Strangway D.W. (1988) Magnetic studies of meteorites. In *Meteorites and the Early Solar System* (eds. Kerridge and Matthews). 595-615. Univ. Arizona Press, Tucson.  
ALHA77005 Shergotty

Sugiura N. and Hoshino H. (1999a) Hydrogen isotopic compositions of carbonate in Martian meteorite ALH84001 (abs#1324). *Lunar Planet. Sci. XXX* Lunar Planetary Institute, Houston (CD-ROM)  
ALH84001

Sugiura N. and Hoshino H. (1999b) H isotopic compositions in ALH84001 (abs). *Antarctic Meteorites XXIV*. Nat. Inst. Polar Res., Tokyo.  
ALH84001

Sugiura N. and Hoshino H. (2000) Hydrogen-isotopic compositions in Allan Hills 84001 and the evolution of the Martian atmosphere. *Meteoritics & Planet. Sci.* 35, 373-380.  
ALH84001

Sunshine J.M., McFadden L.A. and Pieters C.M. (1993) Reflectance spectra of the Elephant Moraine A79001 meteorite: Implications for remote sensing of planetary bodies. *Icarus* 105, 79-91.  
EETA79001

Sutton S.R., Rao M.N., Dreibus G., McKay D.S., Wanke H., Wentworth S., Newville M., Trainor T. and Flynn G.J. (2002) Chlorine/bromine ratios in fracture-filling aqueous alteration products in Nakhla olivine (abs#1278). *Lunar Planet. Sci. XXXIII* Lunar Planetary Institute, Houston. (CD-ROM)  
Nakhla

Sutton S.R., Rao M.N. and Nyquist L.E. (2008) Sulfur and iron speciation in gas-rich impact-melt glasses from basaltic shergottites determined by microxanes (abs#1961). *Lunar Planet. Sci. XXXIX* Lunar Planetary Institute, Houston. (CD-ROM)  
EET79001

Swartz M. (1996) It came from outer space. *Texas Monthly* 122

Swindie T.D. (1988) Noble gases as tracers of the origin and evolution of the Martian atmosphere and the degassing history of the planet. In *Workshop on Mars sample return science*. (eds. Drake *et al.*) *LPI Tech. Rpt.* 88-07, 164-165. Lunar Planetary Institute, Houston.

Swindie T.D. (1995) How many Martian noble gas reservoirs have we sampled? In *Volatile in the Earth and Solar system*. (ed. Farley) *AIP Cong. Proc.* 341, 175-185. Am. Institute of Physics, NY.

Swindie T.D. (1997a) Noble gases on Earth and Mars: Key similarities and differences (abs). *7th Goldschmidt Conf., LPI Contribution* 921, 203. Tucson.

Swindie T.D. (1997b) Life on Mars: What are the chances? (abs) *Meteoritics & Planet. Sci.* 32, A126-127.  
ALH84001

Swindie T.D. (2002a) Martian Noble Gases. *In Reviews of Miner. and Geochem.* Vol 41, 171-190.

Swindie T.D. (2002b) Some puzzles about what noble gas components were mixed into the nakhlites and how (abs). *Un-mixing SNCs.* 57-58. LPI Contribution No. 1134. Lunar Planetary Institute, Houston

Swindie T.D., Caffee M.W., Hohenberg C.M., Hudson G.B. and Rajan R.S. (1984) Noble gases in SNC

meteorites (abs). *Meteoritics* 19, 318-319.

Swindle T.D., Caffee M.W. and Hohenberg C.M. (1986) Xenon and other noble gases in shergottites. *Geochim. Cosmochim. Acta* 50, 1001-1015.  
EETA79001

Swindle T.D., Garrison D., Hohenberg C.M. and Olinger C.T. (1987) Xenon and Argon in Nakhla and Lafayette: Evidence for multiple “Martian” components (abs). *Lunar Planet. Sci. XVIII*, 984-985.  
Lunar Planetary Institute, Houston  
Nakhla, Lafayette

Swindle T.D., Nichols R. and Olinger C.T. (1989) Noble gases in the nakhlite Governador Valadares (abs). *Lunar Planet. Sci. XX*, 1097-1098. Lunar Planetary Institute, Houston  
Governador Valadares

Swindle T.D., Burkland M.K. and Grier J.A. (1994) Noble gases in ALH84001: Not just another SNC (abs). *Meteoritics* 29, 538.  
ALH84001

Swindle T.D., Burkland M.K., Grier J.A., Lindstrom D.L. and Treiman A.H. (1995a) Noble gas analysis and INAA of aqueous alteration products from the Lafayette meteorite: Liquid water on Mars <350 Ma ago (abs). *Lunar Planet. Sci. XXVI*, 1385-1386. Lunar Planetary Institute, Houston  
Lafayette

Swindle T.D., Grier J.A. and Burkland M.K. (1995b) Noble gases in orthopyroxenite ALH84001: A different kind of Martian meteorite with an atmospheric signature. *Geochim. Cosmochim. Acta* 59, 793-801.  
ALH84001

Swindle T.D., Li B. and Kring D.A. (1996) Noble gases in Martian meteorite QUE94201 (abs). *Lunar Planet. Sci. XXVII*, 1297-1298. Lunar Planetary Institute, Houston  
QUE94201

Swindle T.D. and Jones J.H. (1997) The xenon isotopic composition of the primordial Martian atmosphere: Contributions from solar and fission components. *J. Geophys. Res.* 102, 1671-1678.

Swindle T.D. and Kring D.A. (1997) Studies of weathering products in Lafayette meteorite: Implications for the distribution of water on both early and recent Mars (abs). In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life.* (eds. Clifford et al.) *LPI Contribution* 916, 74. Lunar Planetary Institute, Houston.  
Lafayette ALH84001

Swindle T.D., Grier J.A., Li B., Olsen E., Lindstrom D.J. and Treiman A.H. (1997) K-Ar ages for the near-surface liquid water on Mars in the last few hundred million years (abs). *Lunar Planet. Sci. XXVIII*, 1403-1404. Lunar Planetary Institute, Houston  
Lafayette

Swindle T.D., Treiman A.H., Lindstrom D.J., Burkland M.K., Cohen B.A., Grier J. A., Li B. and Olsen E.K. (2000) Noble gases in iddingsite from the Lafayette meteorite: Evidence for liquid water on Mars in the last few hundred million years. *Meteoritics & Planet. Sci.* 35, 107-115.  
Lafayette

Swindle T.D. and Olson E.K. (2002) The timing of aqueous weathering on Mars: Clues from argon-40-Argon-39 analysis of whole rock samples of the nakhlites Nakhla and Lafayette (abs). *Meteoritics & Planet. Sci.* 37, A138.

Nakhla Lafayette

Swindle T.D. and Olson E.K. (2004) 40Ar-39Ar studies of whole rock nakhellites: Evidence for the timing of formation and aqueous alteration on Mars. *Meteoritics & Planet. Sci.* 39, 755-766.  
Nakhla Lafayette

Symes S.J., Borg L.E., Shearer C.K., Asmerom Y. and Irving A.J. (2005) Geochemistry of NWA 1195 based on Rb-Sr and Sm-Nd isotopic systematics (abs#1435). *Lunar Planet. Sci. XXXVI* Lunar Planetary Institute, Houston. (CD-ROM)  
NWA1195

Symes S.J., Borg L.E. and Shearer C.K. (2006) Major and trace element modeling of LREE-depleted shergottites via fractional crystallization from a Y980459-like parent (abs#2043). *Lunar Planet. Sci. Conf. XXXVII* Lunar Planetary Institute, Houston

Szymanski A., Brenker F.E., El Goresy A. and Palme H. (2003a) Complex thermal history of Nakhla and Y000593 (abs#1922). *Lunar Planet. Sci. XXXIV* Lunar Planetary Institute, Houston.  
Nakhla Y000593

Szymanski A., Brenker F.E. and Palme H. (2003b) Evidence for discontinuous evolution of Martian meteorites Nakhla and Y000593 (abs). *Meteoritics & Planet. Sci.* 38, A20.  
Nakhla Y000593

Szymanski A., El Goresy A., Brenker F.E. and Palme H. (2003c) Application of the Fe-Ti-thermometer/oxybarometer to Nakhla and Y000593 (abs). International Symposium. *Evolution of Solar System: A New Perspective from Antarctic Meteorites*, 132-133. Nat. Inst. Polar Res., Tokyo.  
Nakhla Y980459

Tatsumoto M. and Premo W.R. (1988) U-Th-Pb, Sm-Nd, Rb-Sr and Lu-Hf systematics of returned Mars samples (abs). In *Workshop on Mars sample return science*. (eds. Drake *et al.*) *LPI Tech. Rpt.* 88-07, 167-168. Lunar Planetary Institute, Houston.  
Nakhla Shergotty EETA79001 Zagami

Taunton A.E. (1997) SEM studies of Antarctic lunar and SNC meteorites with implications for Martian nanofossils: A progress report (abs). In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life*. (eds. Clifford *et al.*) *LPI Contribution* 916, 76. Lunar Planetary Institute, Houston.

Taunton A.E. (1997) Scanning electron microscopy of lunar and Martian meteorites: Implications for extraterrestrial life. Honors Thesis, University of Arkansas 98 pp

Taylor G.J. (2002a) The wet, oxidizing crust of Mars. In PRS Discoveries. <http://www.psrd.hawaii.edu>

Taylor G.J. (2002b) The tricky business of identifying rocks on Mars. In PRS Discoveries. <http://www.psrd.hawaii.edu>

Taylor H.P., Jr., Duke M.B., Silver L.T. and Epstein S. (1965) Oxygen isotope studies of minerals in stony meteorites. *Geochim. Cosmochim. Acta* 29, 489- 513.  
Shergotty

Taylor L.A., Nazarov M.A., Ivanova M.A., Patchen A., Clayton R.N. and Mayeda T.K. (2000) Petrology of the Dhofar 019 shergottite (abs). *Meteoritics & Planet. Sci.* 35, A155.  
Dho019

Taylor L.A. and ten authors (2002) Martian meteorite Dhofar 019: a new shergottite. *Meteoritics &*

*Planet. Sci.* 37, 1107-1128.

Dho019

Taylor A.P., Barry J.C. and Webb R.I. (2001) Structural and morphological anomalies in magnetosomes: possible biogenic origin for magnetite in ALH84001. *J. Microscopy* 201, 84-106.  
ALH84001

Terada K., Monde T. and Sano Y. (2002) Ion microporbe U-Pb dating and REE analyses of apatites in nakhrites (abs). *Meteoritics & Planet. Sci.* 37, A140.

Terada K., Monde T. and Sano Y. (2004) Ion microporbe U-Th-Pb dating of phosphates in Martian meteorite ALH84001. *Meteoritics & Planet. Sci.* 38, 1697-1703.  
ALH84001

Terada K. and Sano Y. (2005) U-Pb systematics of phosphates in Nakhrites (abs#1178). *Lunar Planet. Sci.* XXXVI Lunar Planetary Institute, Houston. (CD-ROM)

Terho M., Pesonen L.J. and Kukkonen I. T. (1996) Magnetic propoerties of asteroids from meteorite data - Implications for magnetic anomaly detections. *Earth, Moon and Planets* 72, 225-231. Kluwer, Netherlands.  
Chassigny Nakhla Governador Valadares Shergotty Zagami ALHA77005 EETA79001

Terho M. (1997) M. Sc. Thesis. Univ. Helsinki, Finland  
Zagami EETA79001

Terho M. (1998) Magnetic properties and paleointensity studies of two SNC's (abs). *Meteoritics & Planet. Sci.* 33, A153-154.  
Zagami EETA79001

Terribilini D., Eugster O., Burger M., Jakob A. and Krahenbuhl U. (1998) Nobel gases and chemical composition of Shergotty mineral fractions, Chassigny and Yamoto 793605: The trapped argon-40/argon-36 ratio and ejection times of Martian meteorites. *Meteoritics & Planet. Sci.* 33, 677-684.  
Shergotty Chassigny Y793605

Terribilini D., Busemann H. and Eugster O. (2000) Krypton-81-Krypton cosmic-ray exposure ages of the Martian meteorites including the new shergottite Los Angeles (abs). *Meteoritics & Planet. Sci.* 35, A155-156.  
Los Angeles QUE94201 Shergotty Zagami Nakhla Chassigny ALH84001

Theis K.J., Lyon I., Burgess R. and Turner G. (2008) Iron isotopic fractionation in zoned carbonates from ALH84001 (abs#1967). *Lunar Planet. Sci.* XXXIX Lunar Planetary Institute, Houston.  
ALH84001

Theis K.J., Lyon I., Burgess R. and Turner G. (2008) Iron isotopic fractionation of zoned carbonates from ALH84001 (abs). *Meteor. & Planet. Sci.* 43, A153.  
ALH84001

Thomas K.L., Clemett S.J., Romanek C.S., Maechling C.R., Gibson E.K., McKay D.S., Score R. and Zare R.N. (1995a) Polycyclic aromatic hydrocarbons in the Martian (SNC) meteorite Allan Hills 84001: Hydrocarbons from Mars, terrestrial contaminants or both? (abs) *Meteoritics* 30, 587.  
ALH84001

Thomas K.L., Romanek C.S., Clemett S.J., Gibson E.K., McKay D.S., Maechling C.R. and Zare R.N. (1995b) Preliminary analysis of polycyclic aromatic hydrocarbons in the Martian (SNC) meteorite ALH84001 (abs). *Lunar Planet. Sci.* XXVI, 1409-1410. Lunar Planetary Institute, Houston

ALH84001

Thomas K.L., Romanek C.S., McKay D.S., Keller L.P. and Gibson E.K. (1996) Microanalysis of unique fine-grained minerals in the Martian meteorite ALH84001 (abs). *Lunar Planet. Sci.* XXVII, 1327-1328. Lunar Planetary Institute, Houston  
ALH84001

Thomas-Keprta K.L., Romanek C., Wentworth S. J., McKay D.S., Fisler D., Golden D.C. and Gibson E.K. (1997a) TEM analysis of fine-grained minerals in the carbonate globules of Martian meteorite ALH84001 (abs). *Lunar Planet. Sci.* XXVIII, 1433-1434. Lunar Planetary Institute, Houston  
ALH84001

Thomas-Keprta K.L., Wentworth S.J., McKay D.S., Stevens T.O., Golden D.C., Allen C.C. and Gibson E.K. (1997b) The search for terrestrial nanobacteria as possible analogs for the purported Martian nanofossils in the Martian meteorite ALH84001 (abs). *Lunar Planet. Sci.* XXVIII, 1435-1436. Lunar Planetary Institute, Houston  
ALH84001

Thomas-Keprta K.L., Wentworth S.J., McKay D.S., Taunton A.E., Allen C.C., Romanek C.S. and Gibson E.K. (1997c) Subsurface terrestrial microfossils from Columbia River basalt samples: Analogs of features in Martian meteorite Allan Hills 84001? (abs) *Meteoritics & Planet. Sci.* 32, A128.  
ALH84001

Thomas-Keprta K.L., Bazylinski D.A., Goldin D.C., Wentworth S. J., Gibson E.K. and McKay D.S. (1998a) Magnetite from ALH84001 carbonate globules: Evidence of biogenic signatures? (abs#1494) *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Thomas-Keprta K.L., McKay D.S., Wentworth S.J., Stevens T.O., Taunton A.E., Allen C.C., Gibson E.K. and Romanek C.S. (1998b) Mineralization of bacteria in terrestrial basaltic environments: Comparison with possible life forms in Martian meteorite ALH84001 (abs#1489). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Thomas-Keprta K.L., McKay D.S., Wentworth S.J., Stevens T.O., Taunton A.E., Allen C.C., Coleman A., Gibson E.K. and Romanek C.S. (1998c) Bacterial mineralization patterns in basaltic aquifers: Implications for possible life in Martian meteorite ALH84001. *Geology* 26, 1031-1034.  
ALH84001

Thomas-Keprta and many authors (1998d) Mineral biomarkers in Martian meteorite ALH84001? (abs) *Workshop on the Issue Martian Meteorites: Where - - - #7029*. Lunar Planetary Institute, Houston. Lunar Planetary Institute, Houston

Thomas-Keprta K.L., Wentworth S. J., McKay D.S., Bazylinski D.A., Bell M.S., Romanek C.S. and Gibson E.K. (1999a) On the origins of magnetite in Martian meteorite ALH84001 (abs#1856). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM)  
ALH84001

Thomas-Keprta K.L., Bazylinski D.A., Wentworth S.J., McKay D.S., Kirschvink J.L., Clemett S., Bell M.S., Vali H. and Gibson E.K. (1999b) Elongated prismatic magnetite crystals in Martian meteorite ALH84001: Evidence of biogenic signatures? P-130, GSA, Denver.  
ALH84001

Thomas-Keprta and seven authors (2000a) Statistical analysis comparing prismatic magnetite crystals in the ALH84001 carbonate globules with those from the terrestrial magnetotactic bacteria strain MV-1

(abs#1683). *Lunar Planet. Sci.* XXXI Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Thomas-Keprta K.L., Wentworth S.J., McKay D.S. and Gibson E.K. (2000b) Field emission gun scanning electron and transmission electron microscopy of phyllosilicates in Martian meteorites ALH84001, Nakhla and Shergotty (abs#1690). *Lunar Planet. Sci.* XXXI Lunar Planetary Institute, Houston (CD-ROM).

ALH84001 Nakhla Shergotty

Thomas-Keprta and seven authors (2000c) Biogenic Martian magnetic crystals? A comparison of prismatic magnetite crystals in the Allan Hills 84001 carbonate globules with those from magnetotactic bacteria strain MV-1 (abs). *Meteoritics & Planet. Sci.* 35, A156.  
ALH84001

Thomas-Keprta K.L., Bazylinski D.A., Kirschvink J.L., Clemett S.J., McKay D.S., Wentworth S.J., Vali H., Gibson E.K. and Romanek C.S. (2000) Elongated prismatic magnetite crystals in ALH84001 carboante globules: Potential Martian magnetofossils. *Geochim. Cosmochim. Acta* 64, 4049-4081.  
ALH84001

Thomas-Keprta and eight authors (2001a) Truncated hexa-octahedral magnetites: Biosignatures in terrestrial samples and Martian meteorites (abs#2017). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
ALH84001

Thomas-Keprta K.L., Clemett S.J., Bazylinski D.A., Kirschvink J.L., McKay D.S., Wentworth S.J., Vali H., Gibson E.K., McKay M.F. and Romanek C.S. (2001b) Truncated hexa-octahedral magnetite crystals in ALH84001: Presumptive biosignatures. *Proc. Nat. Acad. Sci.* 98, 2164-2169.  
ALH84001

Thomas-Keprta K.L., Clemett S., Romanek C., Bazylinski D., Kirschvink J., McKay D., Wentworth S., Vali H. and Gibson E. (2002a) Multiple origins of magnetite crystals in ALH84001 carbonates (abs#1911). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)  
ALH84001

Thomas-Keprta K.L., Clemett S., Romanek C., Bazylinski D., Kirschvink J., McKay D., Wentworth S., Vali H. and Gibson E. (2002b) Magnetofossils from ancient Mars: a robust biosignature in the Martian meteorite ALH84001. *Applied Environmental Microbiology* 68, 3663-3672.  
ALH84001

Thomas-Keprta and 11 authors (2003) Three-dimensional morphological analysis of ALH84001 magnetite using electron tomography (abs#1669). *Lunar Planet. Sci.* XXXIV Lunar Planetary Institute, Houston.  
ALH84001

Thomas-Keprta K.L., Clemett S.J., McKay D.S., Gibson E.K. and Wentworth S.J. (2007) Re-evaluation of the “Life on Mars” hypothesis: Origin of carbonate-magnetite assemblages in Martian meteorite ALH84001 (abs#5319). *Meteoritics & Planet. Sci.* 42, A148.  
ALH84001

Thomas-Keprta K.L., Clemett S.J., McKay D.S., Gibson E.K. and Wentworth S.J. (2008) Reassesment of the “Life on Mars” hypothesis (abs). *Meteoritics & Planet. Sci.* 43, A154.  
ALH84001

Thomas-Keprta K.L., Clemett S.J., McKay D.S., Gibson E.K. and Wentworth S.J. (2008) Reevaluation of the “Life on Mars” hypothesis: ALH84001 carbonate-magnetite assemblages revisited (abs#2449).

*Lunar Planet. Sci.* XXXIX Lunar Planetary Institute, Houston.  
ALH84001

Thompson J.R., Wiens R.C., Clegg S.M., Barefield J.E., Vaniman D.T. and Newsom H.E. (2006) Remote laser induced breakdown spectroscopy analyses of DaG476 and Zagami Martian meteorites (abs#1761). *Lunar Planet. Sci. Conf.* XXXVII Lunar Planetary Institute, Houston.  
Zagami DaG476

Thompson J.R., Wiens R.C., Clegg S.M., Barefield J.E., Vaniman D.T. and Newsom H.E. (2006) Remote laser-induced breakdown spectroscopy analyses of DaG476 and Zagami Martian meteorites. *J. Geophys. Res.* 111, E05006

Toporski J.K.W., Steele A., Stapleton D. and Goddard D.T. (1999) Contamination of Nakhla by terrestrial microorganisms (abs#1526). *Lunar Planet. Sci. XXX* Lunar Planetary Institute, Houston (CD-ROM)  
Nakhla

Tomkinson T., Wade J., Busemann H., Franchi I.A., Hagermann A., Wright I.P., Wolteres S and Grady M.M. (2008) Studying the oxygen and carbon isotop characteristics of carbonate analogues to ALH84001 (abs). *Meteor. & Planet. Sci.* 43, A155.

Toporski Jan and six authors (2000) Electron microscopy studies, surface analysis and microbial culturing experiments on a depth profile through Martian meteorite Nakhla (abs#1636). *Lunar Planet. Sci. XXXI* Lunar Planetary Institute, Houston (CD-ROM).  
Nakhla

Toporski J., Steele A. and McKay D. S. (2001) Electron microscopy studies and microbial culturing experiments on a depth profile through Martian meteorite Nakhla (abs). *Meteoritics & Planet. Sci.* 36, A207-208.  
Nakhla

Toporski J. and Steele A. (2007) Observations from a 4-year contamination study of a sample depth profile through the Martian meteorite Nakhla. *Astrobiology* 7, 389-401.  
Nakhla

Toulmin P., Baird A.K., Clark B.C., Keil K., Rose H.J., Christian R.P., Evans P.H. and Kelliher W.C. (1977) Geochemical and mineralogical interpretation of the Viking inorganic chemical results. *J. Geophys. Res.* 82, 4625-4634.

Treiman A.H. (1983) Amphibole in the Shergotty meteorite (abs). *Meteoritics* 18, 409-410.  
Shergotty

Treiman A.H. (1985a) Amphibole and hercynite spinel in Shergotty and Zagami: Magmatic water, depth of crystallization, and metasomatism. *Meteoritics* 20, 229-243.  
Shergotty Zagami

Treiman A.H. (1985b) The Nakhla meteorite: Evidence for origin in an ultramafic lava flow (abs). *Lunar Planet. Sci. XVI*, 866-867. Lunar Planetary Institute, Houston  
Nakhla

Treiman A.H. (1986) The parental magma of the Nakhla achondrite: Ultrabasic volcanism on the shergottite parent body. *Geochim. Cosmochim. Acta* 50, 1061-1070.  
Nakhla

Treiman A.H. (1987a) Geology of the nakhlite and Chassigny meteorites (abs). *Meteoritics* 22, 517-518.  
Chassigny Nakhla Lafayette Governador Valadares

- Treiman A.H. (1987b) Geology of the nakhlite meteorites: Cumulate rocks from flows and shallow intrusions (abs). *Lunar Planet. Sci.* XVIII, 1022-1023. Lunar Planetary Institute, Houston
- Treiman A.H. (1988a) Crystal fractionation in the SNC meteorites: Implications for surface units on Mars. In *Workshop on nature and composition of surface units on Mars. LPI Tech. Rpt.* 88-05, 127. Lunar Planetary Institute, Houston.
- Treiman A.H. (1988b) Crystal fractionation in the SNC meteorites: Implications for sample selection. In *Workshop on Mars sample return science. (eds. Drake et al.) LPI Tech. Rpt.* 88-07, 171. Lunar Planetary Institute, Houston.
- Shergotty Zagami Nakhla Chassigny ALHA77005 EETA79001
- Treiman A. H. (1989a) Mineralogy of the SNC meteorites: Primary and secondary. *EOS* 70, 378.
- Treiman A. H. (1989b) Origin of olivine in the Nakhla achondrite, with implications for distribution of Fe/Mg between olivine and augite (abs). *Lunar Planet. Sci.* XX, 1130-1131. Lunar Planetary Institute, Houston
- Nakhla
- Treiman A.H. (1990) Complex petrogenesis of the Nakhla (SNC) meteorite: Evidence from petrography and mineral chemistry. *Proc. Lunar Planet. Sci. Conf.* 20, 273-280. Lunar Planetary Institute, Houston.
- Nakhla
- Treiman A.H. (1992) The parent magma of the Nakhla (SNC) meteorite: Constraints from magmatic inclusions in olivine (abs). *Lunar Planet. Sci.* XXIII, 1447-1448. Lunar Planetary Institute, Houston (CD-ROM).
- Nakhla
- Treiman A.H. (1993a) The parent magma of the Nakhla (SNC) meteorite: Reconciliation of composition estimates from magmatic inclusions and element partitioning (abs). *Lunar Planet. Sci.* XXIV, 1441-1442. Lunar Planetary Institute, Houston (CD-ROM).
- Nakhla
- Treiman A.H. (1993b) Fall days of the SNC meteorites: Evidence for an SNC meteoroid stream, and a common site of origin. *Meteoritics* 27, 93-95.
- Chassigny Zagami
- Treiman A.H. (1993c) Xenoliths in the EETA79001 shergottite: Geological and astronomical implications of similarities to the ALHA77005 and LEW88516 shergottites (abs). *Meteoritics* 28, 451.
- EETA79001 ALHA77005 LEW88516
- Treiman A.H. (1993d) The parent magma of the Nakhla (SNC) meteorite, inferred from magmatic inclusions. *Geochim. Cosmochim. Acta* 57, 4753-4767.
- Nakhla
- Treiman A.H. (1993e) The Martian sources of the SNC meteorites (two, not one), and what can and can't be learned from the SNC meteorites (abs). In *Mars: Past, present, and future results from the MSATT program. (ed. Haberle)* *LPI Tech. Rpt.* 93-06, 49-51. Lunar Planetary Institute, Houston.
- Treiman A.H. (1994a) An ancient age for ALH84001? Petrographic evidence for multiple shock events (abs). *Meteoritics* 29, 542.
- ALH84001

- Treiman A.H. (1994b) Two source areas for the SNC meteorites: Petrologic, chemical and chronologic evidence (abs). *Lunar Planet. Sci.* XXV, 1413-1414. Lunar Planetary Institute, Houston
- Treiman A.H. (1995a) S ≠ NC: Multiple source areas for Martian meteorites. *J. Geophys. Res.* 100, 5329-5340.  
Chassigny Nakhla Lafayette Governador Valadares Shergotty Zagami EETA79001 ALH84001  
ALHA77005 LEW88516
- Treiman A.H. (1995b) A petrographic history of Martian meteorite ALH84001: Two shocks and an ancient age. *Meteoritics* 30, 294-302.  
ALH84001
- Treiman A.H. (1996a) The perils of partition: Difficulties in retrieving magma compositions from chemically equilibrated basaltic meteorites. *Geochim. Cosmochim. Acta* 60, 147-155.  
ALH84001
- Treiman A.H. (1996b) An early warm, wet Mars? Little support from the Martian meteorite ALH84001 (abs). In *Workshop on evolution of Martian volatiles.* (eds. Jakosky and Treiman) *LPI Tech. Rpt.* 96-01, 45-46. Lunar Planetary Institute, Houston.  
ALH84001
- Treiman A.H. (1996c) To see a world in 80 kilograms of rock. *Science* 272, 1447-1448. (*editorial*)
- Treiman A.H. (1997a) Chemical disequilibrium in carbonate minerals of the Martian meteorite ALH84001: Inconsistent with high formation temperature (abs). *Lunar Planet. Sci.* XXVIII, 1445-1446. Lunar Planetary Institute, Houston  
ALH84001
- Treiman A.H. (1997b) Thinking about life on Mars: Dangers and visions (abs). *Lunar Planet. Sci.* XXVIII, 1447-1448. Lunar Planetary Institute, Houston  
ALH84001
- Treiman A.H. (1997c) The Martian meteorite ALH84001: A short review. In *Origins of life and evolution of the biosphere (submitted)*
- Treiman A.H. (1997d) Amphibole in Martian meteorite Elephant Moraine 79001 (abs). *Meteoritics & Planet. Sci.* 32, A129.  
EETA79001
- Treiman A.H. (1997e) Early silicate differentiation in Mars (abs). *7th Goldschmidt Conf., LPI Contribution* 921, 207. Tucson.
- Treiman A.H. (1997f) Surface materials of Mars. In *Mars 2005 sample return workshop.* (ed. Gulick) *LPI Tech. Rpt.* 97-1, 73-77. Lunar Planetary Institute, Houston.
- Treiman A.H. (1998a) The history of ALH84001 revised: Multiple shock events (abs #1195). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001
- Treiman A.H. (1998b) Amphiboles in more Martian meteorites: Elephant Moraine 79001B, Elephant Moraine 79001X and Lewis Cliff 88516 (abs). *Meteoritics & Planet. Sci.* 33, A156.  
EETA79001 LEW88516
- Treiman A.H. (1998c) The history of Allan Hills 84001 revised: Multiple shock events. *Meteoritics & Planet. Sci.* 33, 753-764.

ALH84001

Treiman A.H. (1998d) Controversies (abs#7043). *Workshop on the Issue Martian Meteorites: Where - - -* Lunar Planetary Institute, Houston.

Treiman A.H. (1999) Bad water: Origin of Phoenicochroite-Lanarkite solid solution, Pb<sub>2</sub>O(CrO<sub>4</sub>SO<sub>4</sub>), in Martian meteorite EETA79001 (abs#1124). *Lunar Planet. Sci. XXX* Lunar Planetary Institute, Houston (CD-ROM)  
EETA79001

Treiman A.H. (2000) Heterogeneity of remnant magnetism in ALH84001: Petrologic constraints (abs#1225). *Lunar Planet. Sci. XXXI* Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Treiman A.H. (2001) A hypothesis for the abiotic & non-Martian origins of putative signs of ancient Martian life in ALH84001 (abs#1304). *Lunar Planet. Sci. XXXII* Lunar Planetary Institute, Houston. (CD-ROM)  
ALH84001

Treiman A.H. (2002a) The timing of magnetite formation in ALH84001 carbonate globules (abs). *Meteoritics & Planet. Sci.* 37, A141.  
ALH84001

Treiman A.H. (2002b) Element-element correlations among Martian meteorite bulk compositions: Peculiarities explained(?) by mixing, with implications for the composition of Mars (abs). Un-mixing SNCs. 59-60. LPI Contribution No. 1134. Lunar Planetary Institute, Houston

Treiman A.H. (2003a) Mantle metasomatism in Mars: Evidence from bulk chemical compositions of Martian basalts (abs #1413). *Lunar Planet. Sci. Conf. 34<sup>th</sup>*, Lunar Planetary Institute, Houston (CD-ROM).

Treiman A.H. (2003b) Submicron magnetite grains and carbon compounds in Martian meteorite ALH84001: Inorganic abiotic formation by shock and thermal metamorphism. *Astrobiology* 3, 369-392.

Treiman A.H. (2003c) From the workshop organizers. *Meteoritics & Planet. Sci.* 38, 1711.

Treiman A.H. (2003d) Chemical compositions of Martian basalts (shergottites): Some inferences on basalt formation, mantle metasomatism, and differentiation on Mars. *Meteoritics & Planet. Sci.* 38, 1849-1864.

Treiman A.H. (2005a) Olivine and carbonate globules in ALH84001: A terrestrial analog and implications for water on Mars (abs#1107). *Lunar Planet. Sci. XXXVI* Lunar Planetary Institute, Houston. (CD-ROM)  
ALH84001

Treiman Allan (2005b) The nakhlite meteorites: Augite-rich igneous rocks from Mars. *Chemie der Erde* 65, 203-270. Elsevier (*a read, for sure*)

Treiman A.H. and Drake M.J. (1984) Core formation in the shergottite parent body (SPB) (abs). *Meteoritics* 19, 324-325.

Treiman A.H., Jones J.H. and Drake M.J. (1984) The SNC/Mars connection: Geochemical inconsistencies (abs). *Lunar Planet. Sci. XV*, 864-865. Lunar Planetary Institute, Houston

Treiman A.H., Drake M.J., Hertogen J., Janssens M.-J., Wolf R. and Ebihara M. (1985) Siderophile and chalcophile elements in the shergottite parent body (SPB) and the Earth (abs). *Lunar Planet. Sci.* XVI, 868-869. Lunar Planetary Institute, Houston

Treiman A.H., Drake M.J., Janssens M.-J., Wolf R. and Ebihara M. (1986a) Core formation in the Earth and shergottite parent body (SPB): Chemical evidence from basalts. *Geochim. Cosmochim. Acta* 50, 1071-1091. (*appendix has a useful compilation of old data*)  
ALHA77005 Chassigny EETA79001 Governador Valadares Lafayette Nakhla Shergotty Zagami

Treiman A.H., Jones J.H. and Drake M.J. (1986b) Core formation in the shergottite parent body (SPB) (abs). *Lunar Planet. Sci.* XVII, 901-902. Lunar Planetary Institute, Houston

Treiman A.H., Jones J.H. and Drake M.J. (1987) Core formation in the shergottite parent body and comparison with the Earth. *Proc. Lunar Planet. Sci. Conf.* 17th; *J. Geophys. Res.* 92 (suppl.), E627-E632.

Treiman A.H. and Gooding J.L. (1991) Iddingsite in the Nakhla meteorite: TEM study of mineralogy and texture of pre-terrestrial (Martian?) alterations (abs). *Meteoritics* 26, 402.  
Nakhla

Treiman A.H. and Sutton S.R. (1991) Zagami: Trace element zoning of pyroxenes by synchrotron X-ray (SXRF) microprobe and implications for rock genesis (abs). *Lunar Planet. Sci.* XXII, 1411-1412.  
Lunar Planetary Institute, Houston  
Zagami

Treiman A.H. and Sutton S.R. (1992) Petrogenesis of the Zagami meteorite: Inferences from synchrotron X-ray (SXRF) microprobe and electron microprobe analyses of pyroxenes. *Geochim. Cosmochim. Acta* 56, 4059-4074.  
Zagami

Treiman A.H. and Gooding J.L. (1992) Aqueous-alteration products on the S-N-C meteorites and implications for volatile/regolith interactions. In *Workshop on Martian surface and atmosphere through time*. *LPI Tech. Rpt.* 92-02. Lunar Planetary Institute, Houston.

Treiman A.H., Barrett R.A. and Gooding J.L. (1992a) The Lafayette meteorite: Preterrestrial aqueous alterations (abs). *Lunar Planet. Sci.* XXIII, 1451-1452. Lunar Planetary Institute, Houston  
Lafayette

Treiman A.H., Barrett R.A. and Gooding J.L. (1992b) Geochemistry and setting of Martian (?) “weathering”: The Lafayette meteorite. In *Workshop on chemical weathering on Mars*. (eds. Burns and Banin) *LPI Tech. Rpt.* 92-04, 37-39. Lunar Planetary Institute, Houston.  
Lafayette

Treiman A.H., Barrett R.A. and Gooding J.L. (1993a) Preterrestrial aqueous alteration of the Lafayette (SNC) meteorite. *Meteoritics* 28, 86-97.  
Lafayette

Treiman A.H., McKay G.A., Bogard D.D., Wang M.-S., Lipschutz M.E., Mittlefehldt D.W., Keller L., Lindstrom M.M. and Garrison D. (1994a) Comparison of the LEW88516 and ALHA77005 Martian meteorites: Similar but distinct. *Meteoritics* 29, 581-592.  
EETA79001 LEW88516 ALHA77005

Treiman A.H., Lindstrom D.J. and Martinez R.R. (1994b) The parent magma of xenoliths in shergottite EETA79001: Bulk and trace element composition inferred from magmatic inclusions (abs). *Lunar Planet. Sci.* XXV, 1417-1418. Lunar Planetary Institute, Houston

EETA79001

Treiman A.H., Taylor G.J. and Friedman R. (1995) Nakhla and its look-alikes: Al-depleted magmas and mantle differentiation on Mars and the Earth (abs). *Lunar Planet. Sci.* XXVI, 1419-1420. Lunar Planetary Institute, Houston  
Nakhla

Treiman A.H., Norman M., Mittlefehldt D.W. and Crisp J. (1996) 'Nakhrites' on Earth: Chemistry of clinopyroxenites from Theo's Flow, Ontario, Canada (abs). *Lunar Planet. Sci.* XXVII, 1341-1342. Lunar Planetary Institute, Houston

Treiman A.H. and Lindstrom D.J. (1997) Trace element geochemistry of Martian iddingsite in the Lafayette meteorite. *J. Geophys. Res.* 102, 9153-9163.  
Lafayette

Treiman A.H., Ionov D.A., Amundsen H.E.F., Bunch T. and Blake D.F. (1998) A terrestrial analog for carboantes in ALH84001: Ankerite-magnesite carbonates in mantle xenoliths and basalts from Spetzbergen (abs#1630). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).

Treiman A.H. and Treado P. (1998) Martian maskelynite? Raman spectra of plagioclase-composition glasses from ALH84001, EETA79001 and ALHA77005 (abs#1196). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001 EETA79001 ALHA77005

Treiman A.H. and Romanek C.S. (1998) Bulk and stable isotopic compositions of carbonate minerals in martian meteorite Allan Hills 84001: No proof of high formation temperature. *Meteoritics & Planet. Sci.* 33, 737-742.  
ALH84001

Treiman A.H. and Keller L.P. (2000) Magnetite-bearing layers in Allan Hills 84001 carbonate globules: Bulk and mineral compositions (abs). *Meteoritics & Planet. Sci.* 35, A158-159.  
ALH84001

Treiman A.H., Gleason J.D. and Bogard D.D. (2000) The SNC meteorites are from Mars. *Planet. Space Sci.* 48, 1213-1230. (a review)

Treiman A.H. and Goodrich C.A. (2001) A parent magma for the Nakhla Martian meteorite: Reconciliation of estimates from 1-bar experiments, magmatic inclusions in olivine and magmatic inclusions in augite (abs #1107), *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
Nakhla

Treiman A.H. and Goodrich C.A. (2002) Pre-terrestrial aqueous alteration of the Y000749 nakhelite meteorite (abs). *Antarctic Meteorites* XXVII, 166-167, Nat. Inst. Polar Res., Tokyo.  
Y000749

Treiman A.H., Amundsen H.E.F., Blake D.F. and Bunch T. (2002) Hydrothermal origin for carbonate globules in ALH84001 by analogy with similar carbonates from Spitsbergen (Norway) (abs#1552). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)  
ALH84001

Treiman A.H., Amundsen H.E.F., Blake D.F. and Bunch T. (2003) Hydrothermal origin for carbonate globules in Martian meteorite ALH84001: A terrestrial analogue from Spitzbergen (Norway). *Earth Planet. Sci. Lett.* 204, 323-332.  
ALH84001

Treiman A.H., McCanta M., Dyar M.D., Pieters C.M., Hiri T., Lane M.D. and Bishop J.L. (2006) Brown and clear olivine in chassignite NWA2737: Water and deformation (abs#1314). *Lunar Planet. Sci. Conf.* XXXVII Lunar Planetary Institute, Houston  
NWA2737

Treiman A.H., Dyar M.D., McCanta M., Noble S.K. and Pieters C.M. (2007) Martian dunite NWA2737: Petrographic constraints on geological history, shock events and olivine color. *J. Geophys. Res.* 112, E04002  
NWA2737

Treiman A.H., Musselwhite D.S., Herd C.D.K. and Shearer C.K. (2007) Light lithophile elements in pyroxenes of Northwest Africa (NWA) 817 and other Martian meteorites: Implications for water in Martian magmas. *Geochim. Cosmochim. Acta* 70, 2919-2934.  
NWA817

Treiman A.H. and Irving A.J. (2008) Petrology of Martina meteorite Northwest Africa 998. *Meteorit. & Planet. Sci.* 43, 829-854.  
NWA998

Trieloff M. (2007) Thermochemistry of ALH84001 revisited (abs#5219). *Meteoritics & Planet. Sci.* 42, A149.  
ALH84001

Tschermak G. (1872) Die meteoriten von Shergotty und Gopalpur. *Sitzungsber. Math.-Naturw. Classe. Akad. Wiss. Wien* 65, 122-146.  
Shergotty

Tschermak G. (1885) Die mikroskopische beschaffenheit der meteoriten. (*translated by Wood and Wood, 1964*) *Smithson. Contrib. Astrophysics* 4, number 6. Smithson. Inst. Wash. DC  
Shergotty, Chassigny

Tsuchiyama A., Hirai H., Koishikawa A., Bunno M., McKay G. A. and Lofgren G. E. (1998) An X-ray CT study of ALH84001 analog (abs). *Sym. NIPR Antarctic Meteorites* XXIII, 154-156. Nat. Inst. Polar Res. Japan.  
ALH84001

Tsuchiyama A., Kawabata T., McKay G.A. and Lofgren G.E. (1999) Three-dimensional structure of Martian meteorite ALH84001 by X-ray CT method (abs#1539). *Lunar Planet. Sci. XXX* Lunar Planetary Institute, Houston (CD-ROM)  
ALH84001

Turner G., Burgess R. and Chatzitheodoris E. (1989) Is there Martian water in Nakhla? (abs) *Meteoritics* 24, 333.  
Nakhla

Turner G., Whitby J.A. and Gilmour J.D. (1996) Xenon isotopes in individual minerals in Nakhla: Implications for the noble gas budget of Mars (abs). *Meteoritics & Planet. Sci.* 31, A143-144.  
Nakhla

Turner G., Knott S.F., Ash R.D. and Gilmour J.D. (1997) Ar-Ar chronology of the Martian meteorite ALH84001: Evidence for the timing of the early bombardment of Mars. *Geochim. Cosmochim. Acta* 61, 3835-3850.  
ALH84001

Uchida K. and Takeda H. (1991) Mineralogy of Zagami meteorite with reference to the evolution of materials of achondrite parent body. *Proc. 24th ISAS Lunar Planet. Symp.* 262-268. ISAS, Tokyo.  
Zagami

Ueda Y., Mikouchi T. Miyamoto M. and Hiroi T. (2002) First analysis of the reflectance spectrum of Yamato-000593: The spectroscopic similarity between Yamato-000593 and Nakhla (abs). *Antarctic Meteorites XXVII*, 171-173 Nat. Inst. Polar Res., Tokyo.  
Y000593 Nakhla

Ueda Y., Miyamoto M., Mikouchi T. and Hiroi T. (2003) Reflectance spectra of the Yamato 000593 nakhelite: Spectroscopic similarities to other nakhrites. *Antarct. Meteorite Res.* 16, 94-104. Nat. Inst. Polar Res., Tokyo.  
Y000593 Nakhla

Urey H.C. and Craig H. (1953) The composition of stone meteorites and the origin of meteorites. *Geochim. Cosmochim. Acta* 4, 36-82.  
Shergotty Nakhla

Usui T., Sanborn M.E., Wadhwa M. and McSween H.Y. (2008) Petrogenesis of geochemically enriched lherzolitic shergottites RBT04261 and RBT04262 (abs). *Meteor. & Planet. Sci.* 43, A159.  
RBT04261 RBT04262

Vali H., Zhang C., Sears S. K., Lin S., Phelps T.J., Cole D., Onstott T.C., Kirschvink J.L., Williams-Jones A.E. and McKay D.S. (1997) Formation of magnetite and Fe-rich carbonates by thermophilic bacteria from deep terrestrial subsurface: A possible mechanism for biomineralization in ALH84001 (abs). *Lunar Planet. Sci. XXVIII*, 1473-1474. Lunar Planetary Institute, Houston  
ALH84001

Vali H., Sears S.K., Ciftcioglu N. and Kajander E.O. (1999) Nanofossils and the size limits of life (abs#1890). *Lunar Planet. Sci. XXX* Lunar Planetary Institute, Houston (CD-ROM)  
ALH84001

Valley J.W., Eiler J.M., Graham C.M., Gibson E.K., Romanek C.S. and Stolper E.M. (1997a) Low-temperature carbonate concretions in the Martian meteorite ALH84001: Evidence from stable isotopes and mineralogy. *Science* 275, 1633-1637.  
ALH84001

Valley J.W., Eiler J.M., Graham C.M., Gibson E.K. and Romanek C.S. (1997b) Ion microprobe analysis of oxygen and carbon isotope ratios in the ALH84001 meteorite (abs). *Lunar Planet. Sci. XXVIII*, 1475-1476. Lunar Planetary Institute, Houston  
ALH84001

Valley J.W., Ushikubo T. and Kita N.T. (2007) In situ analysis of three oxygen isotopes and OH in ALH 84001: Further evidence of two generations of carbonates (abs#1147). *Lunar Planet. Sci. XXXVIII*. Lunar Planet. Inst. Houston (CD-ROM)  
ALH84001

Van de Moortele B., Reynard B., McMillan P.F., Wilson M., Beck P., Gillet Ph. and Jahn S. (2007) Shock-induced transformation of olivine to a new metastable  $(\text{Mg}, \text{Fe})_2\text{SiO}_4$  polymorph in Martian meteorites. *Earth Planet Sci. Lett.* 261, 469-475.  
NWA1950 NWA2737

Van de Moortele B., Reynard B., Rochette P., Jackson M., Beck P., Gillet P., McMillan P.F. and McCammon C.A (2007) Shock-induced metallic iron nanoparticles in olivine-rich Martian meteorites. *Earth Planet Sci. Lett.* 262, 37-49.

NWA1950 NWA2737

van der Bogert C.H. and Schultz P.H. (1998) High strain-rate deformation and friction melting as a possible origin for “shock” features in Allan Hills 84001 (abs). Workshop on the Issue Martian Meteorites: Where - - - #7023. Lunar Planetary Institute, Houston.  
ALH84001

van der Borgert C.H., Schultz P.H. and Spray J.G. (1999) Experimental frictional heating of dolomitic marble: New insights for Martian meteorite Allan Hills 84001 (abs#1970). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM)  
ALH84001

Varela M.E., Clocchiatti R., Kurat G. and Massare D. (1997) Glass and multiphase inclusions in Chassigny olivines (abs). *Meteoritics & Planet. Sci.* 32, A130.  
Chassigny

Varela M.E., Clocchiatti R., Kurat G. and Massare D. (1998a) Glass-bearing inclusions in Chassigny olivine: Heating experiments suggest non-igneous origin (abs). *Meteoritics & Planet. Sci.* 33, A158.  
Chassigny

Varela M.E., Kurat G., Clocchiatti R. and Schiano P. (1998b) The ubiquitous presence of silica-rich glass inclusions in mafic minerals: Examples from Earth, Mars, Moon and the aubrite parent body. *Meteoritics & Planet. Sci.* 33, 1041-1051.  
Chassigny

Varela M.E., Kurat G. and Clocchiatti R. (1999) Glass-bearing inclusions in Nakhla augite: Heating experiments suggest a new parental magma composition (abs). *Meteoritics & Planet. Sci.* 34, A115-116.  
Nakhla

Varela M.E., Kurat G., Bonnin-Mosbah M., Clocchiatti R. and Massare D. (2000) Glass-bearing inclusions in olivine of the Chassigny achondrite: Heterogeneous trapping at sub-igneous temperatures. *Meteoritics & Planet. Sci.* 35, 39-52.  
Chassigny

Vauquelin L.N. (1816) Chemical analysis of Chassigny meteorite. *Ann. Chim. Phys. (Paris)* 1, 49-54.  
Chassigny

Velbel M.A. (2008) Aqueous corrosion textures of olivine in Mars meteorite MIL03346 (abs#1905). *Lunar Planet. Sci.* XXXIX Lunar Planetary Institute, Houston  
MIL03346

Vecht A. and Ireland T.G. (2000) The role of vaterite and aragonite in the formation of pseudo-biogenic carbonate structures: Implications for Martian exobiology. *Geochim. et Cosmochim. Acta* 64, 2719-2725.  
ALH84001

Verish R.S. (2002) Meteorite recovery on Dry Lakes – follow the ice rafts (abs). *Meteoritics & Planet. Sci.* 37, A143.

Vicenzi E.P. (2001) Sulfate in the Lafayette meteorite: Evaporitic precipitation beneath Mars or terrestrial alteration (abs). *Meteoritics & Planet. Sci.* 36, A214.  
Lafayette

Vicenzi E.P. (2003) The disposition of hydrogen in Martian meteorite alteration (abs). *Meteoritics &*

*Planet. Sci.* 38, A145.

Vicenzi E.P., Tobin K., Heaney P.J., Onstott T.C. and Chun J. (1997) Carbonate in Lafayette meteorite: A detailed microanalytical study (abs). *Meteoritics & Planet. Sci.* 32, A132-133.  
Lafayette

Vicenzi E.P. and Eiler J. (1998) Oxygen isotopic composition of Martian carbonate and high-resolution secondary ion mass spectrometric imaging of the alteration assemblage in Lafayette meteorite (abs). *Meteoritics & Planet. Sci.* 33, A159-160.  
Lafayette

Vicenzi E.P. and Heaney P.J. (1999) Examining Martian alteration products using *in situ* TEM sectioning: A novel application of the focused ion beam (FIB) for the study of extraterrestrial materials (abs#2005). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM)  
Lafayette

Vicenzi E.P. and Heaney P.J. (2000) Multiple Martian fluids: The alteration sequence in the Lafayette SNC meteorite (abs). *Meteoritics & Planet. Sci.* 35, A164-165.  
Lafayette

Vicenzi E.P., Ries B.L. and Chun J. (2000) A reflectance infrared microprobe study of low temperature alteration products in the Lafayette (SNC) meteorite (abs#1755). *Lunar Planet. Sci.* XXXI Lunar Planetary Institute, Houston (CD-ROM).  
Lafayette

Vicenzi E.P. and Fahey A.J. (2001) Chemical imaging of Nakhelite secondary mineralization at the sub-micrometer length scale: a TOF-SIMS study (abs#2105). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
Nakhla Lafayette

Vicenzi E.P., Fisk M.R., Treiman A. and Wilson S. (2002) Comparison of clay minerals produced during low-temperature alteration of mafic rocks from Earth and Mars (abs). *Meteoritics & Planet. Sci.* 37, A144.

Vicenzi E.P., Fries M., Fahey A., Rost D., Greenwood J.P. and Steele A. (2007) Detailed elemental, mineralogical and isotopic examination of Jarosite in Martian meteorite MIL03346 (abs#2335). *Lunar Planet. Sci.* XXXVIII Lunar Planetary Institute, Houston  
MIL03346

Vicenzi E.P., Davis J., Carpenter P.K., Zeigler R.A. and Jolliff B.L. (2008) Hyperspectral imaging of Martian and Lunar meteorites by scanning laboratory source x-ray microfluorescence spectrometry: A new tool for planetary science (abs#2335). *Lunar Planet. Sci.* XXXIX Lunar Planetary Institute, Houston  
NWA817

Vickery A.M. and Melosh H.J. (1987) The large crater origin for SNC meteorites. *Science* 237, 738-743.

Vieira V.W.A., Costa T.V.V., Knudsen J.M., Jensen H.G., Kemp K. and Bastholm N.H. (1985) Rare earth oxides and the contamination problem in meteorite research. *Physica Scripta* 31, 303-304.

Vieira V.W.A., Costa T.V.V., Jensen H.G., Knudsen J.M., Olsen M. and Vistisen L. (1986) Oxidation state of iron in SNC meteorites as studied by Mössbauer spectroscopy. *Physica Scripta* 33, 180-186.

Vistisen L., Roy-Poulsen N.O., Jensen H.G., Knudsen J.M., Madsen M.B. and Olsen M. (1990) Mössbauer spectroscopy of pyroxenes from the SNC-Meteorite Nakhla (abs). *Meteoritics* 25, 417-

418.  
Nakhla

Vistisen L., Petersen D. and Madsen M.B. (1992) Mössbauer spectroscopy showing large scale inhomogeneity in the presumed Martian meteorite Zagami. *Physica Scripta* 46, 94-96.  
Zagami

Wadhwa M. (1994) *Geochemical studies of two unusual groups of meteorites: Trace elements in SNC meteorites and Mn-Cr systematics in unequilibrated enstatite chondrites.* PhD dissertation, Washington Univ., St. Louis.

Wadhwa M. (2000) Quantitative constraints on the redox state of Martian magmas from Eu anomalies in pyroxenes of basaltic Shergottites (abs#1966). *Lunar Planet. Sci. XXXI* Lunar Planetary Institute, Houston (CD-ROM).

Wadhwa M. (2001) Redox state of Mars' upper mantle and crust from Eu anomalies in shergottite pyroxenes. *Science* 291, 1527-1530.

Wadhwa M., McSween H.Y. and Crozaz G. (1991) Trace element distributions in minerals of EETA79001: clues to the petrogenesis of a unique shergottite (abs). *Meteoritics* 26, 404.  
EETA79001

Wadhwa M. and Crozaz G. (1992a) Trace element microdistributions in the nakhrites: implications for parent melt compositions (abs). *Meteoritics* 27, 302.

Wadhwa M. and Crozaz G. (1992b) REE in minerals in Nakhla and Lafayette: A comparative study of trace element microdistributions (abs). *Lunar Planet. Sci. XXIII*, 1483-1484. Lunar Planetary Institute, Houston  
Nakhla Lafayette

Wadhwa M. and Crozaz G. (1992c) Trace element characteristics of the shergottite LEW88516 (abs). *Meteoritics* 27, 302-303.  
LEW88516.

Wadhwa M. and Crozaz G. (1993) Rare earth elements in individual minerals in shergottites (abs). *Lunar Planet. Sci. XXIV*, 1473-1474. Lunar Planetary Institute, Houston  
Shergotty Zagami EETA79001 ALHA77005 LEW88516

Wadhwa M., McCoy T.J., Keil K. and Crozaz G. (1993) The chemical and physical evolution of late stage melt in Zagami (abs). *Meteoritics* 28, 453-454.  
Zagami

Wadhwa M., McSween H.Y. and Crozaz G. (1994) Petrogenesis of shergottite meteorites inferred from minor and trace element microdistributions. *Geochim. Cosmochim. Acta* 58, 4213-4229.  
Shergotty Zagami EETA79001

Wadhwa M. and Crozaz G. (1994a) Rare earth element distributions in Chassigny: Clues to its petrogenesis and relation to the nakhrites (abs). *Lunar Planet. Sci. XXV*, 1451-1452. Lunar Planetary Institute, Houston  
Chassigny

Wadhwa M. and Crozaz G. (1994b) First evidence for infiltration metasomatism in a Martian meteorite, ALH84001 (abs). *Meteoritics* 29, 545.  
ALH84001

Wadhwa M. and Crozaz G. (1995a) Trace and minor elements in minerals of nakhlites and Chassigny: Clues to their petrogenesis. *Geochim. Cosmochim. Acta* 59, 3629-3647.  
Chassigny Lafayette Nakhla

Wadhwa M. and Crozaz G. (1995b) Constraints on the rare earth element characteristics of metasomatizing fluids in the Martian meteorite ALH84001 (abs). *Lunar Planet. Sci. XXVI*, 1451-1452. Lunar Planetary Institute, Houston  
ALH84001

Wadhwa M. and Crozaz G. (1996) QUE94201: A new and different shergottite (abs). *Lunar Planet. Sci. XXVII*, 1365-1366. Lunar Planetary Institute, Houston  
QUE94201

Wadhwa M. and Lugmair G.W. (1996) The formation age of carbonates in ALH84001 (abs). *Meteoritics & Planet. Sci.* 31, A145.  
ALH84001

Wadhwa M. and Lugmair G.W. (1997) The controversy of young vs. old age of formation of carbonates in ALH84001 (abs). In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life.* (eds. Clifford et al.) *LPI Contribution* 916, 79. Lunar Planetary Institute, Houston.  
ALH84001

Wadhwa M., Crozaz G., Taylor L.A., McSween H.Y. (1997a) Martian basalt (shergottite) QUE94201 and lunar basalt 15555: A tale of two pyroxenes (abs). *Lunar Planet. Sci. XXVIII*, 1485-1486. Lunar Planetary Institute, Houston  
QUE94201

Wadhwa M., McKay G.A. and Crozaz G. (1997b) Trace element distributions in Yamato 793605, a chip off the “Martian lherzolite” block (abs). *NIPR Sym. Antarctic Meteorites* 22nd, 197-199. Nat. Inst. Polar Res., Tokyo.  
Y793605

Wadhwa M., Crozaz G., Taylor L.A. and McSween H.Y. (1998a) Martian basalt (shergottite) Queen Alexandra Range 94201 and lunar basalt 15555; A tale of two pyroxenes. *Meteoritics & Planet. Sci.* 33, 321-328.  
QUE94201

Wadhwa M. and Crozaz G. (1998b) The igneous crystallization history of an ancient Martian meteorite from rare earth element microdistributions. *Meteoritics & Planet. Sci.* 33, 685-692.  
ALH84001

Wadhwa M., Crozaz G., Lentz R. and McSween H.Y. (1999a) Trace-element distributions in the new Saharan Martian meteorite Dar al Gani 476: Another bridge between lherzolitic and basaltic shergottites (abs). *Meteoritics & Planet. Sci.* 34, A117-118.  
DaG476

Wadhwa M., McKay G.A. and Crozaz G. (1999b) Trace element distributions in Yamato-793605, a chip off the “Martian Lherzolite” block. *Antarct. Meteorite Res.* 12, 168-182.  
Y793605

Wadhwa M., Lentz R.C.F., McSween H.Y. and Crozaz G. (2000) Dar al Gani 476 and Dar al Gani 489, twin shergottites from Mars (abs#1413). *Lunar Planet. Sci. XXXI* Lunar Planetary Institute, Houston (CD-ROM).  
DaG476 DaG489

- Wadhwa M., Crozaz G., Lentz R.C.F. and McSween H.Y. (2001a) Trace element microdistributions in Los Angeles: a new basaltic shergottite similar to, yet distinct from the others (abs#1106). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
Los Angeles
- Wadhwa M., Barret J.A. and Crozaz G. (2001b) Petrogenesis of a new Nakhlite from rare earth and other trace element microdistributions (abs). *Meteoritics & Planet. Sci.* 36, A217-218.  
NWA817
- Wadhwa M., Lentz R.C.F., McSween H.Y. and Crozaz G. (2001c) A petrologic and trace element study of Dar al Gani 476 and Dar al Gani 489: Twin meteorites with affinities to basaltic and lherzolitic shergottites. *Meteoritics & Planet. Sci.* 36, 195-208.  
DaG476 DaG489
- Wadhwa M., Sutton S.R., Flynn G.J. and Newville M. (2002) Microdistributions of Rb and Sr in ALH84001 carbonates: Chronological implications for secondary alteration on Mars (abs#1362). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)  
ALH84001
- Wadhwa M. and Crozaz G. (2002a) Trace element abundances in minerals of two new and distinct basaltic shergottites, NWA 856 and NWA 1068 (abs). *Meteoritics & Planet. Sci.* 37, A145  
NWA856 NWA1068
- Wadhwa M. and Grove T.L. (2002b) Archean cratons on Mars?: Evidence from trace elements, isotopes and oxidation states of SNC magmas (abs). 12<sup>th</sup> Goldschmidt Conf. *Geochim. Cosmochim. Acta* 66, A816.
- Wadhwa M. and Crozaz G. (2003a) Trace element geochemistry of new nakhlites from the Antarctic and the Sharan desert: Further constraints on Nakhlite petrogenesis on Mars (abs#2075). *Lunar Planet. Sci.* XXXIV Lunar Planetary Institute, Houston.
- Wadhwa M. and Crozaz G. (2003b) Trace element distributions in minerals of the paired Yamato 000593/749 nakhlites (abs). International Symposium. *Evolution of Solar System: A New Perspective from Antarctic Meteorites*, 144-145. Nat. Inst. Polar Res., Tokyo.  
Y000593 Y000749
- Wadhwa M., Crozaz G. and Barrat J.-A. (2004) Trace element distributions in the Yamato 000593/000749, NWA 817 and NWA 998 nakhlites: Implications for their petrogenesis and mantle sources on Mars. *Antarctic Meteorite Research* 17, 97-116. Nat. Inst. Polar Res., Tokyo.  
Y000593 NWA817 NWA998
- Wadhwa M. and Borg L.E. (2006) Trace element and  $^{142}\text{Nd}$  systematics in the nakhlite MIL03346 and the orthopyroxenite ALH84001: Implications for the Martian mantle (abs#2045). *Lunar Planet. Sci.* XXXVII Lunar Planetary Institute, Houston (CD-ROM).  
MIL03346
- Wagner J.K., Cohen A.J., Hapke B.W. and Partlow W.D. (1980) Vacuum ultraviolet relectance spectra of groups L, LL, and E chondrites and of achondrites. *Proc. Lunar Planet. Sci. Conf.* 11th, 775-797.  
Nakhla Lafayette Shergotty Chassigny
- Walker D., Stolper E.M. and Hays J.F. (1979) Basaltic volcanism: The importance of planet size. *Proc. Lunar Planet. Sci. Conf.* 10th, 1995-2015. Lunar Planetary Institute, Houston
- Walker R J., Asuquo B., Prichard H.M. and Brandon A.D. (1999) Osmium-186-Osmium-187 isotopic

systematics on the early evolution of the mantles of the Earth, Moon and Mars (abs). *Ninth Annual V. M. Goldschmidt Conference* 315, Cambridge

Walker R.J., Brandon A.D., Nazarov M.A., Mittlefehldt D., Jagoutz E. and Taylor L.A. (2002) 187Re-187Os isotopic studies of SNC meteorites: An update (abs#1042). *Lunar Planet. Sci. XXXIII* Lunar Planetary Institute, Houston (CD-ROM)  
DaG SaU Lafayette ALH84001 Dho019 EETA79001

Walker R.J., Putchel I.S., Brandon A.D., Day J.M.D. and Irving A.J. (2009) Re-Os and highly siderophile element systematics of Shergottites : New puzzles regarding the Martian mantle (abs#1263). *Lunar Planet. Sci. XL*, Lunar Planetary Institute, The Woodlands.  
NWA1068 Shergotty Zagami LAR6319 RBT04262

Wallis M.K. (1989) C, N, O isotope fractionation on Mars: Implications for crustal H<sub>2</sub>O and SNC meteorites. *Earth Planet. Sci. Lett.* 93, 321-324.

Walter M.R. and DesMarais D.J. (1993) Preservation of biological information in thermal spring deposits: Developing a strategy for fossil life on Mars. *Icarus* 101, 129-143.

Walton E.L. and Spray J.G. (2002a) Mineralogy and microtextures of melt pockets in the Los Angeles basaltic shergottite (abs). *Meteoritics & Planet. Sci.* 37, A146.  
Los Angeles

Walton E.L. and Spray J.G. (2002b) Chemistry and microtextures of melt pockets in the Los Angeles basaltic shergottite (abs). Un-mixing SNCs. 61. LPI Contribution No. 1134. Lunar Planetary Institute, Houston

Walton E.L. and Spray J.G. (2003) Mineralogy, microtexture and composition of shock-induced melt pockets in the Los Angeles basaltic shergottite. *Meteoritics & Planet. Sci.* 38, 1865-1875.  
Los Angeles

Walton E.L., Spray J.G. and Bartoschewitz R. (2005a) A new Martian meteorite from Oman: Mineralogy, petrology, and shock metamorphism of olivine-phyric basaltic shergottite Sayh al Uhaymir 150. *Meteoritics & Planet. Sci.* 40, 1195-1214.  
SaU150

Walton Erin, Shaw C., Cogswell S. and Spay J. (2005b) Crystallization rates of shock melts in three martian basalts: Experimental simulation with implications for meteoroid dimensions. *Geochim. Cosmochim Acta* 70, 1059-1075.  
Los Angeles SaU150 DaG476

Walton E.L. and Herd Cris D.K. (2006a) Crystallization of mesostasis in two nakhlite meteorites: The fractal approach (abs#1988). *Lunar Planet. Sci. Conf. XXXVII* Lunar Planetary Institute, Houston (CD-ROM).  
Nakhla MIL03346

Walton E.L., Spray John G. and Herd C.D.K. (2006b) Melting rocks by shock: Localized shock melting in Martian meteorites and target rocks from the Manicouagan impact structure (abs#2025). *Lunar Planet. Sci. XXXVII* Lunar Planetary Institute, Houston (CD-ROM).

Walton E.L., Kelley S.P. and Herd C.D.K. (2007) A laser probe 40Ar/39Ar investigation of two Martian lherzolitic basaltic shergottites (abs#5211). *Meteoritics & Planet. Sci.* 42, A159.  
NWA1950 ALH77005

Walton E.L. and Herd C.D.K. (2007) Localized shock melting in lherzolitic shergottite Northwest Africa

1950: Comparison with Allan Hills 77005. *Meteoritics & Planet. Sci.* 42, 63-80.  
NWA1950 ALH77005

Walton E.L., Kelley S.P. and Spray J.G. (2007) Shock implantation of Martian atmospheric argon in four basaltic shergottites: A laser probe 40Ar/39Ar investigation. *Geochim. Cosmochim. Acta* 71, 497-520.  
Los Angeles Zagami DaG476 NWA1068

Walton E.L. and Herd C.D.K. (2007) Dynamic crystallization of shock melts in Allan Hills 77005: Implications for melt pocket formation in Martian meteorites. *Geochim. Cosmochim. Acta* 71, 5267-5285.  
ALH77005

Walton E.L. and Shaw C.S.J. (2008) Dynamic crystallization experiments in natural mineral capsules: Evaluating the heterogeneous nucleation potential of shock melts in Martian meteorites (abs#1892). *Lunar Planet. Sci. XXXIX* Lunar Planetary Institute, Houston (CD-ROM).

Walton E.L., Jugo P. and Herd C.D.K. (2008a) The nature and origin of localized shock melts in Martian meteorites: Major and trace element composition, sulfur speciation and texture of EET79001 shock melt veins and pockets (abs#1880). *Lunar Planet. Sci. XXXIX*, Lunar Planetary Institute, Houston (CD-ROM).  
EETA79001

Walton E.L., Kelley S.P. and Herd C.D.K. (2008b) Isotopic and petrographic evidence for young Martian basalts. *Geochim. Cosmochim. Acta* 72, 5819-5137.  
ALH77005 NWA1950

Walton E.L., Irving A.J., Bunch T.E., Kuchner S.M. and Herd C.D.K. (2009) Extreme shock effects in relatively enriched shergottite Northwest Africa 4797 (abs#1464). *Lunar Planet. Sci. XL*, Lunar Planetary Institute, The Woodlands.  
NWA4797

Wang A., Jolliff B.L. and Haskin L.A. (1998) Raman spectroscopic characterization of Martian meteorite Zagami (abs#1523). *Lunar Planet. Sci. XXIX* Lunar Planetary Institute, Houston (CD-ROM).  
Zagami

Wang A., Jolliff B.L. and Haskin L.A. (1999) Raman spectroscopic characterization of a Martian SNC meteorite: Zagami. *J. Geophys. Res.* 104, 8509-8519.  
Zagami

Wang A., Kuebler K.E. and Jolliff B.L. (2000) Mineral features of EETA79001 Martian meteorite revealed by point-counting Raman measurements as anticipated for in-situ exploration of planetary surfaces (abs#1887). *Lunar Planet. Sci. XXXI*, Lunar Planetary Institute, Houston (CD-ROM).  
EETA79001

Wang A., Kuebler K.E., Freeman J. and Jolliff B.L. (2001a) Preliminary Raman spectroscopic survey on a Martian meteorite – Los Angeles (abs#1427). *Lunar Planet. Sci. XXXI* Lunar Planetary Institute, Houston (CD-ROM)  
Los Angeles

Wang A., Kuebler K.E. and Jolliff B.L. (2001b) Raman spectroscopy of opaque minerals and applications to EETA79001 Martian meteorite (abs#1615). *Lunar Planet. Sci. XXXII* Lunar Planetary Institute, Houston. (CD-ROM)  
EETA79001

Wang A., Kuebler K.E., Jolliff B.L. and Haskin L.A. (2003) Fe-Ti-Cr-oxides in Martian meteorite

EETA79001 studied by point-counting procedure using Raman spectroscopy (abs#1742). *Lunar Planet. Sci.* XXXIV Lunar Planetary Institute, Houston  
EETA79001

Wang A., Kuebler K.E., Jolliff B.L. and Haskin L.A. (2004) Mineralogy of a Martian meteorite as determined by Raman spectroscopy. *J. of Raman Spec.* 35, 504-514.

Wang A., Kuebler K.E., Jolliff B.L. and Haskin L.A. (2004) Raman spectroscopy of fe-Ti-Cr-oxides, case study: Martian meteorite EETA79001. *Am. Mineral.* 89, 665-680.  
EETA79001

Wang H., Wang R., Zhang F., Lin C., Zhang W., and Zhou L. (2002) Antarctic CRV 99027 meteorite: A new member in martian meteorite. *Chinese Journal of Polar Research* 14:300-307.

Wang M-S., Mokos J. and Lipschutz M.E. (1997) Volatile and other trace elements in Martian meteorites (abs). *Lunar Planet. Sci.* XXVIII, 1493-1494. Lunar Planetary Institute, Houston  
ALHA77005 EETA79001 QUE94201 Shergotty Zagami Lafayette Nakhla Governador Valadares Chassigny ALH84001 LEW88516

Wang M-S., Mokos J. A. and Lipschutz M. E. (1999) Martian meteorites: Volatile trace elements and cluster analysis. *Meteoritics & Planet. Sci.* 33, 671-675.  
QUE94201 ALH84001 Nakhla Lafayette Governador Valadares Chassigny

Wänke H. (1987) Chemistry and accretion of the Earth and Mars. *Bull. Soc. Geologique de France* 3, 13-19.

Wänke H. (1991) Chemistry, accretion and evolution on Mars. *Space Sci. Rev.* 56, 1-8.

Wänke H. (1988) Overview of Mars: SNC meteorite results. In *Workshop on Mars sample return science.* (eds. Drake et al.) *LPI Tech. Rpt.* 88-07, 175-176. Lunar Planetary Institute, Houston

Wänke H. and Dreibus G. (1984) Chemistry and accretion of Earth and Mars (abs). *Lunar Planet. Sci.* XV, 884-885. Lunar Planetary Institute, Houston

Wänke H. and Dreibus G. (1985) The degree of oxidation and the abundance of volatile elements on Mars (abs). *Lunar Planet. Sci.* XVI, Suppl. A, 28-29. Lunar Planetary Institute, Houston

Wänke H., Dreibus G., Jagoutz E., Palme H., Spettel B. and Weckwerth G. (1986) ALHA77005 and on the chemistry of the Shergotty parent body (Mars) (abs). *Lunar Planet. Sci.* XVII, 919-920. Lunar Planetary Institute, Houston  
ALHA77005

Wänke H. and Dreibus G. (1988) Chemical composition and accretion history of terrestrial planets. *Phil. Trans. Roy. Soc. London* A325, 545-557.

Wänke H., Dreibus G., Jagoutz E. and Mukhin L. M. (1992) Volatiles on Mars: The role of SO<sub>2</sub> (abs). *Lunar Planet. Sci.* XXIII, 1489-1490. Lunar Planetary Institute, Houston

Wänke H. and Dreibus G. (1992) On the Martian volatiles as inferred from SNC-meteorites (abs). *NIPR Sym. Antarctic Meteorites* 17th, 143-144. Nat. Inst. Polar Res., Tokyo.

Wänke H. and Dreibus G. (1996) The chemical composition of the Martian interior (abs). *Lunar Planet. Sci.* XXVII, 1375-1376. Lunar Planetary Institute, Houston

Wänke H. and Dreibus G. (1997a) New evidence for silicon as the major light element in the Earth's core

(abs). *Lunar Planet. Sci.* XXVIII, 1495-1496. Lunar Planetary Institute, Houston

Wänke H. and Dreibus G. (1997b) Silicon in the Earth core, sulfur in the core of Mars (abs). *7th Goldschmidt Conf., LPI Contribution* 921, 213. Tucson.

Warmflash D.M., Clemett S.J. and McKay D.S. (2001) Organic matter in SNC meteorites: Is it time to re-evaluate the Viking biology experimental data? (abs#2169) *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)

Warmflash D.M., Clemett S.J., Gibson E.K., Fox G.F., Longazo T. and McKay D.S. (2002) Organic matter in the Nakhla meteorite: Implications for the Viking experiments and near-future missions to Mars (abs). *Meteoritics & Planet. Sci.* 65<sup>th</sup> meeting at UCLA Nakhla

Warren P.H. (1986) Compositional contrast between Martian regolith and SNC meteorites: Evidence for buried massive carbonates? (abs) *Lunar Planet. Sci.* XVII, 923-924. Lunar Planetary Institute, Houston

Warren P.H. (1987) Mars regolith versus SNC meteorites: Possible evidence for abundant crustal carbonates. *Icarus* 70, 153-161.

Warren P.H. (1994a) A carbonate-rich piece of Mars, disguised as a diogenite. *Meteoritics* 29, 152-153. (*editorial*)  
ALH84001

Warren P.H. (1994b) Lunar and Martian meteorite delivery services. *Icarus* 111, 338-363.

Warren P.H. (1998a) Petrologic evidence for low-temperature, possible flood-evaporitic origin of carbonates in the ALH84001 meteorite (abs). *Meteoritics & Planet. Sci.* 33, A162-163.  
ALH84001

Warren P.H. (1998b) Petrologic evidence for low-temperature, possibly flood-evaporitic origin of carbonates in the ALH84001 meteorite. *J. Geophys. Res.* 103, 16,759-16,773.

Warren P.H. (1998c) The common ion effect in deposition of Martian (eg ALH84001) carbonates. (abs) *Workshop on the Issue Martian Meteorites: Where - - - #7040.* Lunar Planetary Institute, Houston.

Warren P.H. (1999) Reply to dubious arguments put forward by Scott *et al.* *J. Geophys. Res.* 104, 24,217-24,221.

Warren P.H. (2001a) Martian meteorite mixology. *Meteoritics & Planet. Sci.* 36, 191. (*an editorial*)

Warren P.H. (2002b) Porosities of lunar meteorites: Strength, porosity, and petrologic screening during the meteorite delivery process. *J. Geophys. Res.* 106, 10,101-10,111.

Warren P.H. and Kallemeyn G.W. (1987) A trio of meteoritic dunites, and new data for Shergotty (abs). *Lunar Planet. Sci.* XVIII, 1056-1057. Lunar Planetary Institute, Houston  
Shergotty

Warren P.H. and Kallemeyn G.W. (1995) Siderophile trace elements in Allan Hills 84001 and other achondrites: A temporal increase of oxygen fugacity in the Martian mantle? (abs) *Meteoritics* 30, 593-594.  
ALH84001

Warren P.H. and Kallemeyn G.W. (1996) Siderophile trace elements in ALH84001, other SNC meteorites

and eucrites: Evidence of heterogeneity, possibly, time-linked, in the mantle of Mars. *Meteoritics & Planet. Sci.* 31, 97-105.  
ALH84001

Warren P.H., Kallemeyn G.W., Arai T. and Kaneda K. (1996) Compositional-petrologic investigations of eucrites and the QUE94201 shergottite (abs). *Proc. NIPR Sym. Antarctic Meteorites* 21st, 195-197.  
Nat. Inst. Polar Res., Tokyo.  
QUE94201

Warren P.H. and Kallemeyn G.W. (1997a) Yamato-793605 and other presumed Martian meteorites: Composition and petrogenesis (abs). *NIPR Sym. Antarctic Meteorites* 22nd, 197-199. Nat. Inst. Polar Res., Tokyo.  
Y793605 ALH77005 EETA79001 QUE94201

Warren P.H. and Kallemeyn G.W. (1997b) Yamato-793605, EET79001 and other presumed Martian meteorites: Compositional clues to their origins. *Antarctic Meteorite Research* 10, 61-81. Nat. Inst. Polar Res., Tokyo.  
Y793605 ALH77005 EETA79001, QUE94201

Warren P.H. and Kallemeyn G.W. (1997c) Origin of the "A" lithology in presumed Martian meteorite Elephant Moraine 79001: Assimilation-mixing more likely than impact melting (abs). *Meteoritics & Planet. Sci.* 32, A135-136.  
EETA79001

Warren P.H., Kallemeyn G.H. and Kyte F.T. (1998) Planetary core formation: Evidence from highly siderophile elements in Martian meteorites (abs#7037). *Workshop on the Issue Martian Meteorites: Where - -*. Lunar Planetary Institute, Houston.

Warren P.H., Kallemeyn G.W. and Kyte F.T. (1999) Origin of planetary cores: Evidence from highly siderophile elements in martian meteorites. *Geochim. Cosmochim. Acta* 63, 2105-2122.

Warren P.H., Greenwood J.P., Richardson J.W., Rubin A.E. and Verish R.S. (2000a) Geochemistry of Mars, a ferroan, La- and Th-rich basalt from Los Angeles (abs#2001). *Lunar Planet. Sci.* XXXI  
Lunar Planetary Institute, Houston (CD-ROM).  
Los Angeles

Warren P.H., Greenwood J.P. and Rubin A.E. (2000b) Los Angeles at Chicago (abs). *Meteoritics & Planet. Sci.* 35, A166.  
Los Angeles

Warren P.H., Greenwood J.P. and Rubin A.E. (2004) Los Angeles: A tale of two stones. *Meteoritics & Planet. Sci.* 39, 137-156.  
Los Angeles

Warren P.H. and Bridges J.C. (2005) Geochemical subclassification of shergottites and the crustal assimilation model (abs#2098). *Lunar Planet. Sci.* XXXVI  
Lunar Planetary Institute, Houston. (CD-ROM)

Wasch R. and Schade U. (1996) Infrared spectroscopy of lithologically different areas of a piece of the Zagami meteorite (abs). *Meteoritics & Planet. Sci.* 31, A146-A147.  
Zagami

Wasserman A.A. and Berthka C.M. (2000) An experimental study of the formation of symplectite lamallae in the Nakhla Martian meteorites (abs#1516). *Lunar Planet. Sci.* XXXI  
Lunar Planetary Institute, Houston (CD-ROM).

Nakhla

- Watson J.T. and Wetherill G.W. (1979) Dynamical, chemical and isotopic evidence regarding the formation locations of asteroids and meteorites. In *Asteroids* (ed. Gehrels), 926-974. Univ. Ariz. Press, Tucson.
- Wasylewski L.E., Jones J.H., Le L. and Jurewicz A.J.G. (1993) Equilibrium and fractional crystallization of a primitive shergottite composition (abs). *Lunar Planet. Sci. XXIV*, 1491-1492. Lunar Planetary Institute, Houston
- Watson L.L., Ihinger P.D., Epstein S. and Stolper E.M. (1991) Hydrogen, carbon and oxygen isotopic of volatiles in Nakhla (abs). *Lunar Planet. Sci. XXII*, 1473-1474. Lunar Planetary Institute, Houston
- Nakhla
- Watson L.L., Epstein S. and Stolper E.M. (1992) Hydrogen and carbon isotopic composition of volatiles in Nakhla: Implications for weathering on Mars (abs). In *Workshop on the Martian surface through time* (ed. Haberle et al.). *LPI Tech. Rpt. 92-02*, 165-166. Lunar Planetary Institute, Houston.
- Nakhla
- Watson L.L., Hutcheon I.D., Epstein S. and Stolper E.M. (1993a) High D/H ratios of water in magmatic amphiboles in Chassigny: Possible constraints on the isotopic composition of magmatic water on Mars (abs). *Lunar Planet. Sci. XXIV*, 1493-1494. Lunar Planetary Institute, Houston
- Chassigny
- Watson L.L., Hutcheon I.D., Epstein S. and Stolper E.M. (1993b) D/H ratios and water contents of amphiboles in magmatic inclusion in Chassigny and Shergotty (abs). *Meteoritics* 28, 456-457.
- Chassigny Shergotty
- Watson L.L., Hutcheon I.D., Epstein S. and Stolper E.M. (1994a) Water on Mars: Clues from deuterium/hydrogen and water contents of hydrous phases in SNC meteorites. *Science* 265, 86-90.
- Chassigny Shergotty Zagami
- Watson L.L., Epstein S. and Stolper E.M. (1994b) The abundance and stable isotopic composition of volatiles released from weathering products during stepped heating of Nakhla and Lafayette (abs). *Lunar Planet. Sci. XXV*, 1471-1472. Lunar Planetary Institute, Houston
- Nakhla Lafayette
- Watson L.L., Epstein S. and Stolper E. M. (1994c) D/H of water released by stepped heating of Shergotty, Zagami, Chassigny, ALH84001 and Nakhla (abs). *Meteoritics* 29, 547.
- Shergotty Zagami Chassigny ALH84001 Nakhla
- Weber I. and Bischoff A. (1999) Microstructures in pyroxenes from the Martian meteorite Zagami and the achondrites Bishopville (aubrite), Hammadah al Hamra 064, and Jalanash (urelites) (abs). *Meteoritics Planet. Sci.* 34, A120-121.
- Zagami
- Weber I., Greshake A. and Bischoff A. (2000) Low-cristobalite in the Martian meteorite Zagami (abs#1342). *Lunar Planet. Sci. XXXI* Lunar Planetary Institute, Houston (CD-ROM).
- Zagami
- Weckwerth G. (1983) Dipl. Thesis, Univ. Mainz, Mainz.
- Weckwerth G. and Wänke H. (1984) Chemical relationships among shergottites, nakhrites, and Chassigny (abs). *Meteoritics* 19, 331-332.
- Chassigny

- Weidner E., Frey F., Pederson B., Burghammer M. and Schmidbauer E. (2005) Cation distribution in pyroxenes from Martian meteorite (abs#1409). *Lunar Planet. Sci.* XXXVI Lunar Planetary Institute, Houston. (CD-ROM)
- Weinke H.H. (1978) Chemical and mineralogical examination of the Nakhla achondrite. *Meteoritics* 13, 660-664.  
Nakhla
- Weisberg M.K. et al. (2008) Met. Bull. MAPS 43, 1551-1588.
- Weiss B.P., Kirschvink J.L., Baudenbacher F.J., Vali H., Peters N.T., Macdonald F.A. and Wikswo J.P. (2000a) Reconciliation of magnetic and petrographic constraints on ALH84001? Panspermia lives on! (abs#2078). *Lunar Planet. Sci.* XXXI Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001
- Weiss B.P., Kirschvink J.L., Baudenbacher F.J., Vali H., Peters N.T., Macdonald F.A. and Wikswo J.P. (2000b) A low temperature transfer of ALH84001 from Mars to Earth. *Science* 290, 791-795.  
ALH84001
- Weiss B.P., Vali H., Baudenbacher F.J., Stewart S.T. and Kirschvink J.L. (2001) Records of an ancient Martian magnetic field in ALH84001 (abs#1244). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
ALH84001
- Weiss B.P., Vali H., Baudenbacher F.J., Kirschvink J.L., Stewart S.T. and Shuster D.L. (2002a) Records of an ancient Martian magnetic field in ALH84001. *Earth Planet. Sci. Lett.* 201, 449-463.  
ALH84001
- Weiss B.P., Shuster D.L. and Stewart S.T. (2002b) Temperatures on Mars from 40Ar/39Ar thermochronology of ALH84001. *Earth Planet. Sci. Lett.* 201, 465-472.  
ALH84001
- Weiss B.P., Vali H., Baudenbacher F.J., Shuster D.L., Stewart S.T. and Kirschvink J.L. (2002c) Records of an ancient Martian magnetic field and climate in ALH84001 (abs). 12<sup>th</sup> Goldschmidt Conf. *Geochim. Cosmochim. Acta* 66, A827.  
ALH84001
- Weiss B.P. and Shuster D.L. (2005) Martian surface paleotemperatures from thermochronometry of meteorites (abs#1156). *Lunar Planet. Sci.* XXXVI Lunar Planetary Institute, Houston. (CD-ROM)
- Wentworth S.J. and Gooding J.L. (1986) Shergottite EETA79001: Petrologic heterogeneity and secondary alteration in Lithology C (abs). *Meteoritics* 21, 536-537.  
EETA79001
- Wentworth S.J. and Gooding J.L. (1988a) Calcium carbonate in Nakhla: Further evidence for pre-terrestrial secondary minerals in SNC meteorites (abs). *Meteoritics* 23, 310.  
Nakhla
- Wentworth S.J. and Gooding J.L. (1988b) Chloride and sulfate minerals in the Nakhla meteorite (abs). *Lunar Planet. Sci.* XIX, 1261-1262. Lunar Planetary Institute, Houston  
Nakhla
- Wentworth S.J. and Gooding J.L. (1989) Calcium carbonate and silicate “rust” in the Nakhla meteorite (abs). *Lunar Planet. Sci.* XX, 1193-1194. Lunar Planetary Institute, Houston

## Nakhla

Wentworth S.J. and Gooding J.L. (1990) Pre-terrestrial origin of “rust” in the Nakhla meteorite (abs). *Lunar Planet. Sci.* XXI, 1321-1322. Lunar Planetary Institute, Houston  
Nakhla

Wentworth S.J. and Gooding J.L. (1991a) Carbonate and sulfate minerals in the Chassigny meteorite (abs). *Lunar Planet. Sci.* XXII, 1489-1490. Lunar Planetary Institute, Houston  
Chassigny

Wentworth S.J. and Gooding J.L. (1991b) Carbonate and sulfate minerals in the Chassigny meteorite (abs). *Meteoritics* 26, 408.  
Chassigny

Wentworth S.J. and Gooding J.L. (1993) Weathering features and secondary minerals in Antarctic shergottites ALHA77005 and LEW88516 (abs). *Lunar Planet. Sci.* XXIV, 1507-1508. Lunar Planetary Institute, Houston  
ALHA77005 LEW88516

Wentworth S.J. and Gooding J.L. (1994) Carbonates and sulfates in the Chassigny meteorite: Further evidence for aqueous chemistry on the SNC parent planet. *Meteoritics* 29, 860-863.  
Chassigny

Wentworth S.J. and Gooding J.L. (1995) Carbonates in the Martian meteorite, ALH84001: Water-borne but not like the SNCs (abs). *Lunar Planet. Sci.* XXVI, 1489-1490. Lunar Planetary Institute, Houston  
ALH84001

Wentworth S.J. and Gooding J.L. (1996) Water-based alteration of the Martian meteorite, QUE94201, by sulfate-dominated solutions (abs). *Lunar Planet. Sci.* XXVII, 1421-1422. Lunar Planetary Institute, Houston  
QUE94201

Wentworth S.J., Thomas-Keprrta K.L., Taunton A.E., Vebel M.A. and McKay D.S. (1998a) Possible weathering features in ALH84001 (abs#1793). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Wentworth S.J., Thomas-Keprrta K.L. and McKay D.S. (1998b) Alteration products and secondary minerals in Martian meteorite ALH84001 (abs#7034). *Workshop on the Issue Martian Meteorites: Where - - - - .* Lunar Planetary Institute, Houston.

Wentworth S.J. and McKay D.S. (1999) Weathering and secondary minerals in the Nakhla meteorite. (abs#1946). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM)  
Nakhla

Wentworth S.J., Thomas-Kerpta K.L. and McKay D.S. (2000) Weathering and secondary minerals in the Martian meteorite Shergotty (abs#1888). *Lunar Planet. Sci.* XXXI Lunar Planetary Institute, Houston (CD-ROM).  
Shergotty

Wentworth S.J., Velbel M.A., Thomas-Keprrta K.L., Longazo G. and McKay D.S. (2001) Weathering of Martian evaporites (abs#2108). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)

Wentworth S.J., Thomas-Keprrta K.L. and McKay D.S. (2002) Water on Mars: Petrographic evidence

(abs#1932). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)  
Nakhla

Westfall F. (1999) The nature of fossil bacteria: A guide to the search for extraterrestrial life. *J. Geophys. Res.* 104, 16437-16451.

Westall F., deWit M.J. and Dann J. (1997) What do fossil bacteria look like? Examples of 3.5 billion-year old mineral bacteria and the search for the evidence of life in extraterrestrial rocks (abs). *Lunar Planet. Sci.* XXVIII, 1543-1544. Lunar Planetary Institute, Houston  
ALH84001

Westall F., Gobbi P., Gerneke D. and Mazzotti G. (1998a) Microstructures in the carboante globules of Martian meteorite ALH84001: Preliminary results of a high resolution SEM study (abs#1362). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
ALH84001

Westall F., Gobbi P., Gerneke D. and Mazzotti G. (1998b) Ultrastructure in the carbonate globules of Martian meteorite ALH84001. In *Exobiology: Matter, energy, and information in the origin and evolution of life in the Universe* 245-250. (eds. Chela-Flores and Raulin) Kluwer Academic Pub. Dordrecht.

Westall F., Gobbi P., Mazzotti G., Gerneke D. Stark R. W., Drobek T., Heckl W.M., Gibson E., McKay D., Allen C., Steele A., and Thomas-Kepra K. (1998c) Combined SEM (secondary electrons, backscatter, cathodoluminescence) and atomic force microscope investigation of fracture surfaces in Martian meteorite ALH84001: Preliminary results. *Proc. SPIE Conf. On Inst. Methods and Missions in Astrobiology*, 3441, 225-233. San Diego.

Wetherill G.W. and many authors (1981) Radiogenic and stable isotopes, radiometric chronology, and basaltic volcanism. In *Basaltic Volcanism on the Terrestrial Planets* 901-1047. Pergamon Press.  
(review paper)  
Nakhla Lafayette Governador Valadares Shergotty Chassigny

Wetherill G.W. (1984) Orbital evolution of impact ejecta from Mars. *Meteoritics* 19, 1-13.

Weyland M., Midgley P.A., Dunin-Borkowski R.E., Frankel R.B. and Buseck P.R. (2002) Advanced TEM techniques for assessing the possible biogenic origin of meteoritic magnetite crystals (abs#1592). *Lunar Planet. Sci.* XXXIII Lunar Planetary Institute, Houston. (CD-ROM)  
ALH84001

Whitaker M.L., Nekvasil H. and Lindsley D.H. (2005) Potential magmatic diversity on Mars (abs#1440). *Lunar Planet. Sci.* XXXVI Lunar Planetary Institute, Houston. (CD-ROM)

Wiechert U., Halliday A.N., Lee D.-C. and Rumble D. (2001) Oxygen isotopes and the origin of tungsten isotope variations in Martian meteorites (abs). *Meteoritics & Planet. Sci.* 36, A224-225.  
ALH84001 Lafayette Zagami Shergotty Chassigny Nakhla ALH77005

Wiens R.C. (1987) CO<sub>2</sub> and noble gas emplacement into basalt by artificial shock; Relevance to EETA79001 trapped gas (abs). *Lunar Planet. Sci.* XVIII, 1082-1083. Lunar Planetary Institute, Houston  
EETA79001

Wiens R.C. (1988a) What we think we know from noble gases in shergottite EETA79001 (abs). *Meteoritics* 23, 311.  
EETA79001

Wiens R.C. (1988b) Noble gases released by vacuum crushing of EETA79001 glass. *Earth Planet. Sci. Lett.* 91, 55-65.  
EETA79001

Wiens R.C. (1988c) *Laboratory shock emplacement of gases into basalt, and comparison with trapped gases in shergottite EETA79001*. PhD Dissertation, University of Minnesota 175 pp.  
EETA79001

Wiens R.C., Becker R.H. and Pepin R.O. (1984) Remeasurement of nitrogen in EETA79001 glass (abs).  
*Meteoritics* 19, 336-337.  
EETA79001

Wiens R.C. and Pepin R.O. (1986) Laboratory shock emplacement of low ambient pressure gases into basalt: Relation to EETA79001 trapped gas (abs). *Meteoritics* 21, 540.  
EETA79001

Wiens R.C., Becker R.H. and Pepin R.O. (1986) The case for a Martian origin of the shergottites. II. Trapped and indigenous gas components in EETA79001 glass. *Earth Planet. Sci. Lett.* 77, 149-158.  
EETA79001

Wiens R.C. and Pepin R.O. (1987) Where in the glass is the gas? Siting studies on shergottite EETA79001 and laboratory shocked analogues (abs). *Meteoritics* 22, 527-528.  
EETA79001

Wiens R.C. and Pepin R.O. (1988) Laboratory shock emplacement of noble gases, nitrogen, and carbon dioxide into basalt, and implications for trapped gases in shergottite EETA79001. *Geochim. Cosmochim. Acta* 52, 295-307.  
EETA79001

Wittke J.H., Bunch T.E., Irving A.J., Farmer M. and Strope J. (2006) Northwest Africa 2975: An evolved basaltic shergottite with vesicular glass pockets and trapped melt inclusions (abs#1368). *Lunar Planet. Sci.* XXXVII Lunar Planetary Institute, Houston  
NWA2975

Wood C.A. and Ashwal L.D. (1981a) Meteorites from Mars: Prospects, problems and implications (abs). *Lunar Planet. Sci.* XII, 1197-1199. Lunar Planetary Institute, Houston

Wood C.A. and Ashwal L.D. (1981b) SNC meteorites: Igneous rocks from Mars? *Proc. Lunar Planet. Sci. Conf.* 12th, 1359-1375. (review paper)

Wood J.A. and 16 authors (2002) *The Quarantine and Certification of Martian Samples*. Space Science Board, National Resource Council. Wash. D.C. <http://www.nap.edu/books>

Wood J.A. and 13 authors (2003) Assessment of Mars Science and Mission Priorities. COMPLEX. Space Science Board, National Resource Council. Wash. D.C. <http://www.nap.edu/books> pp 132  
(note: appendix B is a useful compilation of all previous COMPLEX recommendations)

Wooden J.L., Nyquist L.E., Bogard D.D., Bansal B.M., Wiesmann H., Shih C.-Y. and McKay G.A. (1979) Radiometric ages for the achondrites Chervony Kut, Governador Valadares, and Allan Hills 77005. (abs) *Lunar Planet. Sci.* X, 1379-1381. Lunar Planetary Institute, Houston  
ALHA77005 Governador Valadares

Wooden J.L., Shih C.-Y., Nyquist L.E., Bansal B.M., Wiesmann H. and McKay G.A. (1982) Rb-Sr and Sm-Nd isotopic constraints on the origin of EETA79001: A second Antarctic shergottite (abs). *Lunar Planet. Sci.* XIII, 879-880. Lunar Planetary Institute, Houston

EETA79001

Wright I.P., Carr R.H. and Pillinger C.T. (1986) Carbon abundance and isotopic studies of Shergotty and other shergottite meteorites. *Geochim. Cosmochim. Acta* 50, 983-991.  
Shergotty Zagami ALHA77005 EETA79001

Wright I.P., Grady M.M. and Pillinger C.T. (1987a) Carbon and nitrogen in Nakhla and EETA79001 (abs). *Meteoritics* 22, 535-536.  
EETA79001 Nakhla

Wright I.P., Grady M.M. and Pillinger C.T. (1987b) Carbonates in EETA79001: Terrestrial or Martian? (abs). *Lunar Planet. Sci.* XVIII, 1106-1107. Lunar Planetary Institute, Houston  
EETA79001

Wright I.P., Grady M.M. and Pillinger C.T. (1988a) Carbon, oxygen and nitrogen isotopic compositions of possible Martian weathering products in EETA79001. *Geochim. Cosmochim. Acta* 52, 917-924.  
EETA79001

Wright I.P., Grady M.M. and Pillinger C.T. (1988b) Stable isotopic studies of H, C, N, O and S in samples of Martian origin. In *Workshop on Mars sample return science*. (ed. Drake *et al.*) *LPI Tech. Rpt.* 88-07, 179-180. Lunar Planetary Institute, Houston.

Wright I.P., Grady M.M. and Pillinger C.T. (1989) Organic materials in a Martian meteorite. *Nature* 340, 220-222.  
EETA79001

Wright I.P., Grady M.M. and Pillinger C.T. (1990a) The evolution of atmospheric CO<sub>2</sub> on Mars: The perspective from carbon isotope measurements. *J. Geophys. Res.* 95, 14,789-14,794.

Wright I.P., Grady M. M. and Pillinger C.T. (1990b) A search for carbonate minerals in Chassigny (abs). *Lunar Planet. Sci.* XXI, 1353-1354. Lunar Planetary Institute, Houston  
Chassigny

Wright I.P., Grady M.M. and Pillinger C.T. (1992a) Chassigny and the nakhlites: Carbon-bearing components and their relationship to Martian environmental conditions. *Geochim. Cosmochim. Acta* 56, 817-826.  
Chassigny Nakhla Lafayette Governador Valadares

Wright I.P., Pillinger C.T. and Grady M.M. (1992b) Nitrogen in Zagami (abs). *Meteoritics* 27, 309.  
Zagami

Wright I.P., Pillinger C.T. and Grady M.M. (1992c) An investigation of the carbon in different lithologies of Zagami (abs). *Lunar Planet. Sci.* XXIII, 1553-1554. Lunar Planetary Institute, Houston  
Zagami

Wright I.P., Grady M.M. and Pillinger C.T. (1992d) Determinations of stable isotopic compositions of H, C, N, O and S at the Martian surface using mass spectrometry and stepped combustion/pyrolysis (abs). In *Workshop on innovative instrumentation for the in situ study of atmosphere-surface interactions on Mars*. (eds. Fegley and Wänke). *LPI Tech. Rpt.* 92-07, 19. Lunar Planetary Institute, Houston.

Wright I.P., Hartmetz C.P. and Pillinger C.T. (1992e) Martian surficial carbon - constraints from isotopic measurements of shock-produced glass in EETA79001 (abs). In *Workshop on the evolution of the Martian atmosphere*. *LPI Contribution* 787, 28-29. Lunar Planetary Institute, Houston.  
EETA79001

Wright I.P., Pillinger C.T. and Grady M.M. (1992f) Attempts to comprehend Martian surface processes in SNC meteorites through interpretation of isotopic compositions of carbonates in SNC meteorites. In *Workshop on chemical weathering on Mars.* (eds. Burns and Banin) *LPI Tech. Rpt.* 92-04. 39-41. Lunar Planetary Institute, Houston.

Wright I.P., Russell S.S., Boyd S.R., Meyer C. and Pillinger C.T. (1992g) Xylan, a potential contaminant for lunar samples and Antarctic meteorites. *Proc. Lunar Planet. Sci. Conf.* 22, 449-458. Lunar Planetary Institute, Houston.  
EETA79001

Wright I.P., Douglas C. and Pillinger C.T. (1993a) The carbon components in SNC meteorites of feldspathic harzburgite composition (abs). *Lunar Planet. Sci. XXIV*, 1539-1540. Lunar Planetary Institute, Houston.  
ALHA77005, LEW88516

Wright I.P., Douglas C. and Pillinger C.T. (1993b) Further carbon isotope measurements of LEW88516 (abs). *Lunar Planet. Sci. XXIV*, 1541-1542. Lunar Planetary Institute, Houston.  
LEW88516

Wright I.P., Hartmetz C.P. and Pillinger C.T. (1993c) An assessment of the nature and origins of the carbon-bearing components in the fines collected during the sawing of EETA79001. *J. Geophys. Res.* 98, 3477-3482.  
EETA79001

Wright I.P., Grady M.M. and Pillinger C.T. (1993d) Carbonates, sulfates, phosphates, nitrates and organic materials: their association in a Martian meteorite. In *Mars: past and future - results from the MSATT program* (ed. Haberle) *LPI Tech. Rpt.* 93-06, 56-57. Lunar Planetary Institute, Houston.

Wright I.P. and Pillinger C.T. (1994) On the isotopic chemistry of carbon at the Martian surface. *Phil. Trans. Roy. Soc. London A* 349, 309-321.

Wright I.P., Grady M.M. and Pillinger C.T. (1994) The acquisition of Martian sedimentary rocks: For the time being, collection of meteorites from terrestrial desert areas represents the best hope (abs). In *Workshop on meteorites from cold and hot deserts.* (eds. Schultz et al.) *LPI Tech Rpt.* 95-02, 77-78. Lunar Planetary Institute, Houston.

Wright I.P., Grady M.M. and Pillinger C.T. (1995) An interpretation of  $^{14}\text{C}$  measurements of weathering products in SNC meteorites (abs). *Lunar Planet. Sci. XXVI*, 1523-1524. Lunar Planetary Institute, Houston.  
EETA79001 ALH84001

Wright I.P., Grady M.M. and Pillinger C.T. (1996a) Has Martian atmosphere CO<sub>2</sub> become depleted in  $^{13}\text{C}$  with time? (abs) *Workshop on evolution of Martian volatiles.* (eds. Jakosky and Treiman) *LPI Tech. Rpt.* 96-01, 47. Lunar Planetary Institute, Houston.

Wright I.P. et al. (1996b) *In Searching for life in the Solar System and beyond.* (eds. Pillinger and Penny) The Royal Society, London.

Wright I.P., Grady M.M. and Pillinger C.T. (1997a) Evidence relevant to the life on Mars debate. (I)  $^{14}\text{C}$  results (abs). *Lunar Planet. Sci. XXVIII*, 1585-1586. Lunar Planetary Institute, Houston.  
EETA79001

Wright I.P., Grady M.M. and Pillinger C.T. (1997b) Evidence relevant to the life on Mars debate. (II) Amino acids results (abs). *Lunar Planet. Sci. XXVIII*, 1587-1588. Lunar Planetary Institute, Houston.

EETA79001

Wright I.P., Grady M.M. and Pillinger C.T. (1997c) An investigation into the association of organic compounds with carbonates in ALH84001 (abs). *Lunar Planet. Sci.* XXVIII, 1589-1590. Lunar Planetary Institute, Houston.  
ALH84001

Wright I.P., Grady M.M. and Pillinger C.T. (1997d) Isotopically light carbon in ALH84001: Martian metabolism or Teflon contamination? (abs). *Lunar Planet. Sci.* XXVIII, 1591-1592. Lunar Planetary Institute, Houston.  
ALH84001

Wright I.P., Assanov S., Verchovsky A.B., Franchi I.A., Grady M.M. and Pillinger C.T. (1997e) Further investigations of isotopically light carbon in ALH84001 (abs). In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life.* (eds. Clifford *et al.*) *LPI Contribution* 916, 86. Lunar Planetary Institute, Houston.  
ALH84001

Wright I.P., Grady M.M. and Pillinger C.T. (1998a) On the  $^{14}\text{C}$  and amino acids in Martian meteorites (abs#1594). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).

Wright I.P., Grady M.M., Gardner A.F. and Pillinger C.T. (1998b) The carbon isotopic composition of PAHs, hydrocarbons and other organic compounds in Nakhla (abs#1583). *Lunar Planet. Sci.* XXIX Lunar Planetary Institute, Houston (CD-ROM).  
Nakhla

Wright I.P., Grady M.M. and Pillinger C.T. (1998c) Further carbon isotopic measurements of carbonates in ALH84001 (abs). *Meteoritics & Planet. Sci.* 33, A169.  
ALH84001

Wright I.P., Grady M.M. and Pillinger C.T. (1999) Dar al Gani - Lucky for some, unlucky for others (abs#1594). *Lunar Planet. Sci.* XXX Lunar Planetary Institute, Houston (CD-ROM).  
DaG476

Wyatt M.B., McSween H.Y., Christensen P.R. and Head J.W. (2003) Basalt, altered basalt, and andesite on the Martian surface: Observations, interpretations and outstanding questions (abs). Sixth International Conf. on Mars. #3271

Xirouchakis D.M. *et al.* (2000) *EOS* 81, 48, F782 AGU

Xirouchakis D.M., Draper D.S. and Schwandt C.S. (2001) A reappraisal of the mineralogy and crystallization features of Los Angeles, a basaltic Martian meteorite (abs#1589). *Lunar Planet. Sci.* XXXII Lunar Planetary Institute, Houston. (CD-ROM)  
Los Angeles

Xirouchakis D.M., Draper D.S., Schwandt C.S. and Lanzilliotti A. (2002) Crystallization conditions of Los Angeles, a basaltic Martian meteorite. *Geochim. Cosmochim. Acta* 66, 1867-1880.  
Los Angeles

Yamada I., Mikouchi T. and Miyamoto M. (1997b) Symplectic exsolution in olivine from the Nakhla Martian meteorite (abs). *Meteoritics & Planet. Sci.* 32, A144.  
Nakhla

Yamada I., Mikouchi T., Miyamoto M. and Murakami T. (1997a) Lamella inclusion in olivine from Nakhla (SNC) meteorite (abs). *Lunar Planet. Sci.* XXVIII, 1597-1598. Lunar Planetary Institute,

Houston  
Nakhla

Yamada K., Nakamura N., Misawa K., Premo W.R., Yamashita K. and Tatsumoto M. (2003) Sm-Nd isotopic systematics of the lherzolitic shergottite Yamato-793605 (abs). International Symposium. *Evolution of Solar System: A New Perspective from Antarctic Meteorites*, 148. Nat. Inst. Polar Res., Tokyo.

Y793605

Yamaguchi A. and Sekine T. (2000) Monomineralic mobilization of plagioclase by shock: An experimental study. *Earth Planet. Sci. Lett.* 175, 289-296.

Yamashita K., Nakamura N., Imae N., Misawa K. and Kojima H. (2002) Pb isotopic signature of Martian meteorite Yamato 000593 (a preliminary report) (abs). *Antarctic Meteorites XXVII*, 180-182, Nat. Inst. Polar Res., Tokyo

Y000593

Yamashita K., Nakamura N. and Heaman L.M. (2003) Pb isotopic systematics of Yamato 000593 (abs). International Symposium. *Evolution of Solar System: A New Perspective from Antarctic Meteorites*, 151-152. Nat. Inst. Polar Res., Tokyo.

Y000593

Yanai K. (1984) Locality map series of Antarctic meteorites. Sheet 1 Allan Hills. Nat. Inst. Polar Res., Tokyo.

Yanai K. (1995) Re-searching for Martian rocks from diogenite-diogenitic achondrites (abs). *Lunar Planet. Sci. XXVI*, 1533-1534. Lunar Planetary Institute, Houston

Y793605

Yanai K. (1996) Martian meteorites: An attempt reclassification based on their compositions, lithologies and ages (abs). *Meteoritics & Planet. Sci.* 31, A157.

Y793605

Yanai K. (1977) First meteorites found in Victoria Land, Antarctica, December 1976 and January 1977. *Proceedings of the second symposium on Yamato meteorites*. 51-69. Nat. Inst. Polar Res., Tokyo.

Yanai K. (1997a) General view of the Martian meteorites (abs). *Lunar Planet. Sci. XXVIII*, 1603-1604. Lunar Planetary Institute, Houston

Yanai K. (1997b) General view of twelve Martian meteorites. *Mineral. J.* 19, 65-74

Yanai K. (2002) New Martian meteorite identified as a lherzolitic shergottite similar to ALH77005 meteorite (abs#1248). *Lunar Planet. Sci. XXXIII* Lunar Planetary Institute, Houston. (CD-ROM)  
YA1075

Yanai K., Cassidy W. A., Funaki M. and Glass B. P. (1978) Meteorite recoveries in Antarctica during field season 1977-78. *Proc. Lunar Planet. Sci. Conf.* 9th, 977-987.

Yanai K. and Iguchi M. (1981) *Photographic catalog of the selected Antarctic meteorites*. page 60 Nat. Inst. Polar Res., Tokyo.  
ALHA77005

Yanai K. and Kojima H. (1987) *Photographic catalog of the Antarctic meteorites*. page 52 Nat. Inst. Polar Res., Tokyo.  
ALHA77005

- Yang J. and Epstein S. (1985) A study of stable isotopes in Shergotty meteorite (abs). *Lunar Planet. Sci.* XVI, Suppl. A, 25-26. Lunar Planetary Institute, Houston.  
Shergotty
- Yarus M. (1997) A skeptical view. *The Planetary Report* XVII, 18-19.  
ALH84001
- Yen A.S. and 18 authors (2006) Nickel on Mars: Constraints on meteoritic material at the surface. *J. Geophys. Res.* 111, E12S11
- Yin Q., Jacobsen S.B., Yamashita K., Blichert-Toft J., Telouk P. and Albarede F. (2002) A short timescale for terrestrial planet formation from Hf-W chronology of meteorites. *Nature* 418, 949-952.
- Yoshida M., Ando H., Ohmoto K., Naruse R. and Ageta Y. (1971) Discovery of meteorites near Yamoto Mountains, East Antarctica. *Antarctic Record* 39, 62-65. Nat. Inst. Polar Res., Tokyo
- Zahnle K.J. (1993) Xenological constraints on the impact erosion of the early Martain atmosphere. *J. Geophys. Res.* 98, 10899-10913.
- Zbik M. and Gostin V.A. (1996a) Comparison between elemental ratios in fusion crusts of Stannern eucrite, lunar meteorite MAC 88105 and Martian meteorite Nakhla (abs). *Lunar Planet. Sci. XXVII*, 1487-1488. Lunar Planetary Institute, Houston  
Nakhla
- Zbik M. and Gostin V.A. (1996b) Comparison between elemental ratios in fusion crusts and minerals of lunar and Martain meteorites (abs). *Meteoritics & Planet. Sci.* 31, A158-A159.  
Nakhla
- Zent A.P. (2001) Use of SNC meteorites to constrain the role of oxidants in the Martian regolith (abs#1770). *Lunar Planet. Sci. XXXII* Lunar Planetary Institute, Houston. (CD-ROM)
- Zhang Y. (2003) Volatiles on Mars (abs#1336). *Lunar Planet. Sci. Conf.* 34<sup>th</sup>, Lunar Planetary Institute, Houston (CD-ROM). Lunar Planetary Institute, Houston
- Zhang C., Vali H., Romanek C.S., Roh Y., Sears S.K. and Phelps T.J. (1999) Chemical and morphological characterization of siderite formed by iron-reducing bacteria (abs#1855). *Lunar Planet. Sci. XXX* CD-ROM Lunar Planetary Institute, Houston
- Zipfel J. (1999) Pyroxene and olivine in basaltic shergottite Dar al Gani 476 (abs). *Meteoritics & Planet. Sci.* 34, A123.  
DaG476
- Zipfel J. (2000) Sayh al Uhaymir 005/008 and its relationship to Dar al Gani 476/489 (abs). *Meteoritics & Planet. Sci.* 35, A178.  
SaU005, SaU008
- Zipfel J. (2001) Lucky 13 and Martian meteorites. *Meteoritics & Planet. Sci.* 35, 470. (editorial)
- Zipfel J., Spettel B., Palme H. and Dreibus G. (1999) Petrology and chemistry of Dar al Gani 476, a new basaltic shergottite (abs#1206). *Lunar Planet. Sci. XXX* Lunar Planetary Institute, Houston (CD-ROM).  
DaG476
- Zipfel J., Scherer P., Spettel B., Dreibus G. and Schultz L. (2000) Petrology and chemistry of the new

shergottite Dar al Gani 476. *Meteoritics & Planet. Sci.* 35, 95-106.  
DaG476

Zipfel J. and Goodrich C.A. (2001a) Rare earth element systematics of trapped melt inclusions and groundmass phases in Sayh al Uhaymir 005 (abs#1292). *Lunar Planet. Sci. XXXII* Lunar Planetary Institute, Houston. (CD-ROM)  
SaU005

Zipfel J. and Goodrich C.A. (2001b) REE in melt inclusions in olivine of ALH77005 (abs). *Meteoritics & Planet. Sci.* 36, A232.  
ALH77005

Zipfel J. and Goodrich C.A. (2002) The origin of megacrysts in SAU005 and EETA79001 (Lithology A): Evidence from a study of melt inclusions (abs#1279). *Lunar Planet. Sci. XXXIII* Lunar Planetary Institute, Houston. (CD-ROM)  
SaU005 EETA79001

Ziemelis K. (1994) Meteorite made with a fizz. *Nature* 372, 616.  
ALH84001

Zolensky M.E., Schutt J.W., Reid A.M., Jâkes P., Martinez de los Rios E. and Miller R.M. (1994) Locating new meteorite recovery areas. In *Workshop on meteorites from cold and hot deserts. (eds. Schultz et al.) LPI Tech Rpt.* 95-02, 78-80. Lunar Planetary Institute, Houston.

Zolensky M.E. (1998) The flux of meteorites to Antarctica. In Grady, Hutchison, McCall and Rothery (eds) "Meteorites: flux with time and impact effects". Geological Society Spec. Pub. No. 140, London

Zolotov M.Y. and Shock E.L. (1999) Abiotic synthesis of polycyclic aromatic hydrocarbons on Mars. *J. Geophys. Res.* 104, 14,033 – 14,050.

Zolotov M.Y. and Shock E.L. (2000) An abiotic origin for hydrocarbons in the Allan Hills 84001 Martian meteorite through cooling of magmatic and impact-generated gases. *Meteoritics & Planet. Sci.* 35, 629-638.  
ALH84001